IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

The San Diego walker: https://mountain-man-60.blogspot.com/2013/02/painted-gorge-anza-borrego-desert.html

November 2, 2015
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

October 4, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP/PSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
LST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On November 2, 2015, State and Local Ambient Air Monitoring Stations (SLAMS), located in Westmorland (AQS Site Code 060254003), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Referenced Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler measured a (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentration of 179 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Westmorland was the only station in Imperial County to measure an exceedance of the PM_{10} NAAQS on November 2, 2015.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON NOVEMBER 2, 2015

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
11/2/2015	**Westmorland**	**06-025-4003**	**1**	**24**	**179**	**150**
11/2/2015	Niland	06-025-4004	1	24	39	150
11/2/2015	*Brawley	06-025-0007	1	24	-	150
11/2/2015	*Calexico	06-025-0005	1	24	-	150
11/2/2015	El Centro	06-025-1003	1	24	88	150
11/2/2015	Westmorland	06-025-4003	3	22	117	150
11/2/2015	Niland	06-025-4004	3	24	131	150
11/2/2015	Brawley	06-025-0007	3	23	128	150
11/2/2015	El Centro	06-025-1003	3	23	90	150

All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]
*The FRM samplers at the Brawley and Calexico stations failed to run properly on November 2, 2015. In addition, the Calexico station did not operate a continuous PM monitor in 2015.

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013, all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous PM_{10} data from Federal Equivalent Method (FEM) Beta Attenuation Monitor Model 1020's (BAM 1020) into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On November 2, 2015, the Westmorland monitor was impacted by elevated particulate matter caused by the transport of fugitive windblown dust from high winds generated by the passing of a low-pressure trough from the northwest into Southern California.

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2015, Pacific Daylight Time (PDT) is March 8 through November 1. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

This report demonstrates that a naturally occurring event caused an exceedance observed on November 2, 2015, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude the PM_{10} 24-hour NAAQS exceedance of 179 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the November 2, 2015 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the event affected air quality. Overall, this section provides the evidence that the event was a natural event.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Westmorland station. This section discusses and establishes how the November 2, 2015 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the November 2, 2015 event and its resulting emissions defining the event as a “natural event”.[3]

Section IV - Provides evidence that the event of November 2, 2015 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the National Weather Service (NWS) forecast synopsis from the San Diego and Phoenix offices. The San Diego office described a low-pressure trough in Northern California moving into Southern California by the afternoon and evening. The system was expected to bring afternoon to evening rain and strong winds to the mountains and deserts. With showers continuing Tuesday. The Phoenix office described the strong Pacific low-pressure affecting Arizona on Tuesday with light showers across Central Arizona. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "Partial Burn" day in Imperial County. **Appendix A** contains copies of pertinent notices to the October 4, 2015, exceptional event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. Notification occurs when an agency submits a request, which includes an initial event description, for flagging data in AQS.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentration from the Westmorland monitor on March 7, 2016. Subsequently there after the ICAPCD sent a revised request on March 18, 2016 providing additional information describing the event. **Table 1-1** above provides the correct concentration for Westmorland. The difference in concentrations between local and standard has an insignificant impact on any data analysis. The submitted request included a brief description of the meteorological conditions for November 2, 2015 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on June 28, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 179 µg/m^3 (**Table 1-1**), which occurred on November 2, 2015 in Westmorland. The final closing date for comments was July 30, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR 50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County continue to discuss any potential documentation of events.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the October 4, 2015 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on November 2, 2015 satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event “is not reasonably controllable and not reasonably preventable.”
- e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
- f The event is a “natural event” where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitors.

II November 2, 2015 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the November 2, 2015 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National

Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

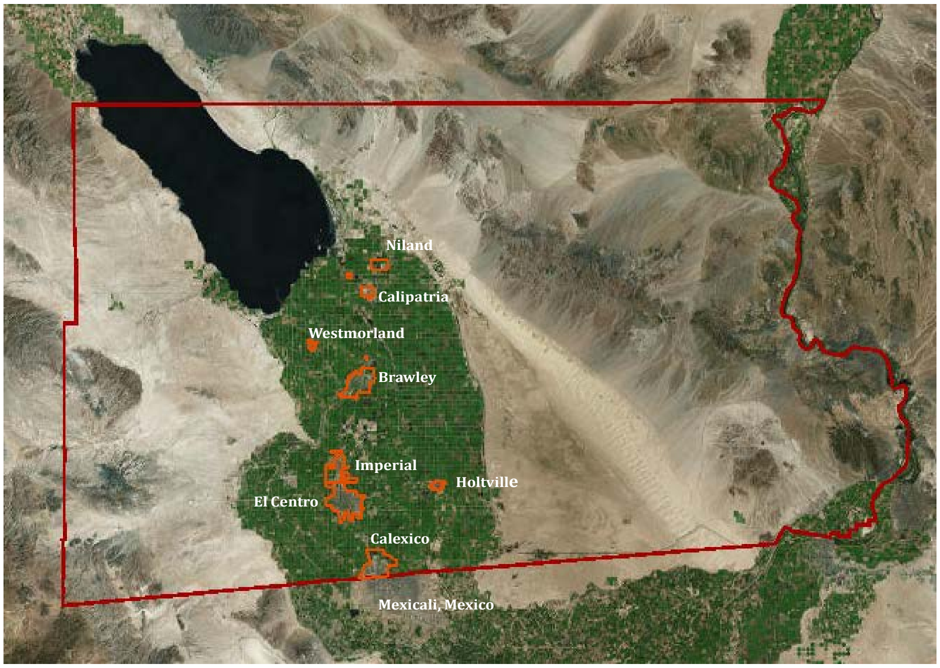


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

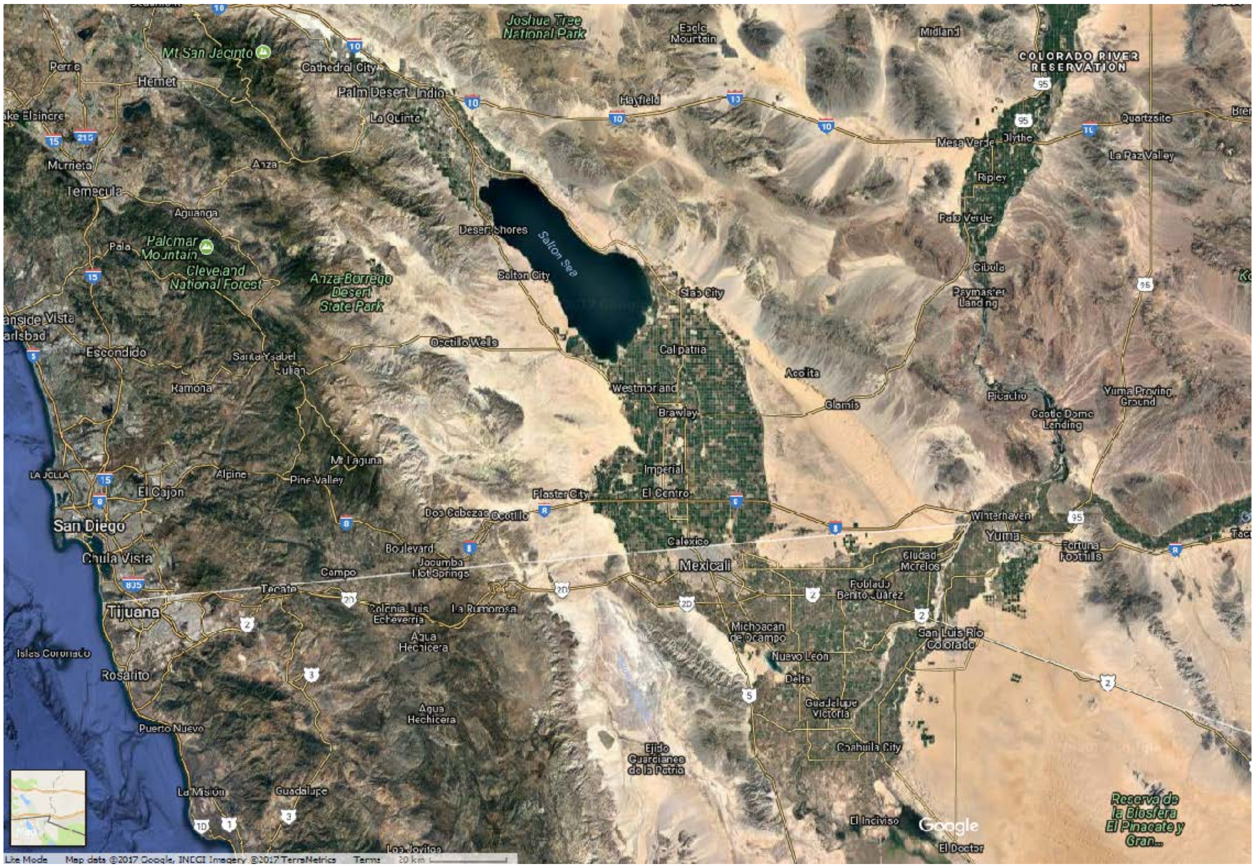


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County).

As mentioned above, the PM_{10} exceedances on November 2, 2015, occurred at the Westmorland station. The Brawley, Niland and Westmorland stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on November 2, 2015, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

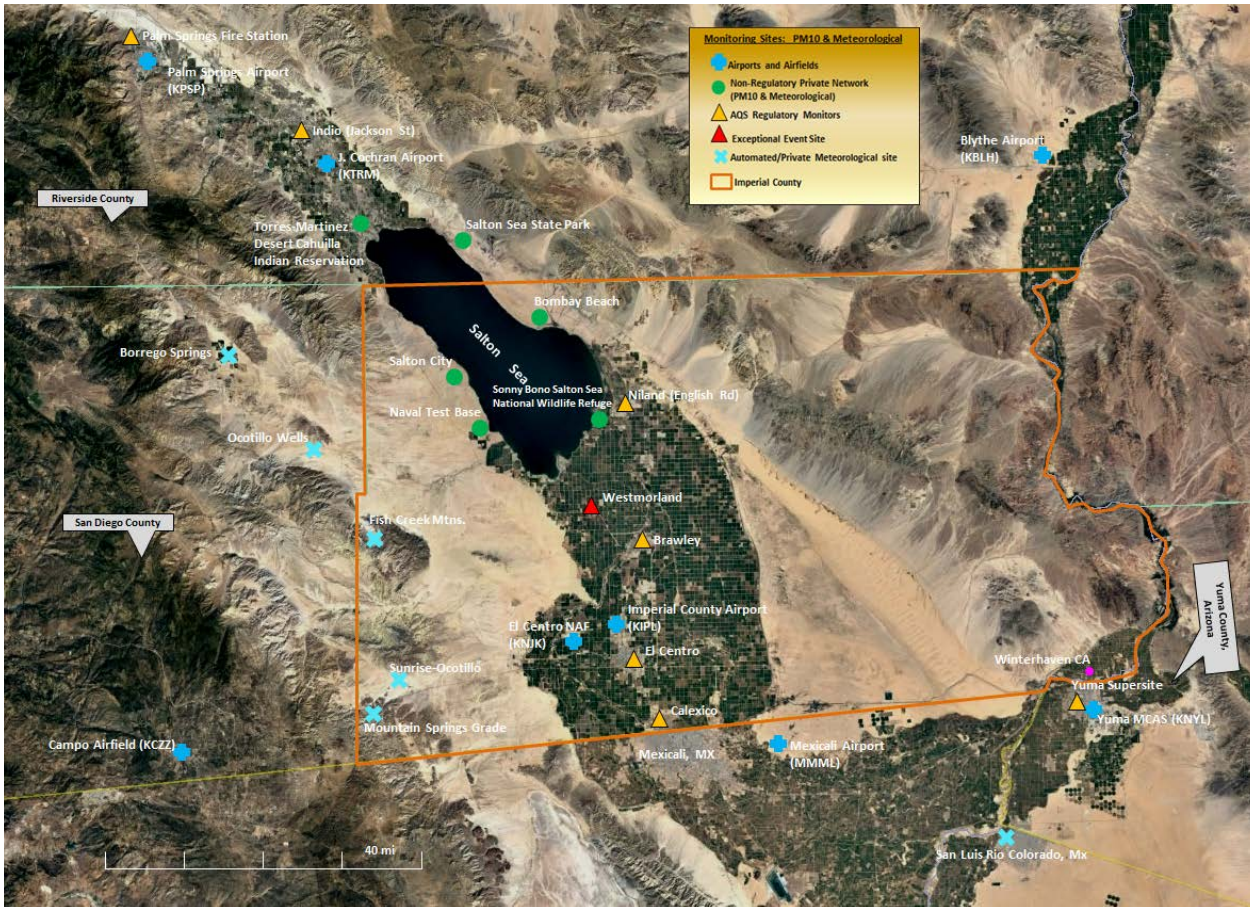


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth.

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These privately owned stations are non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

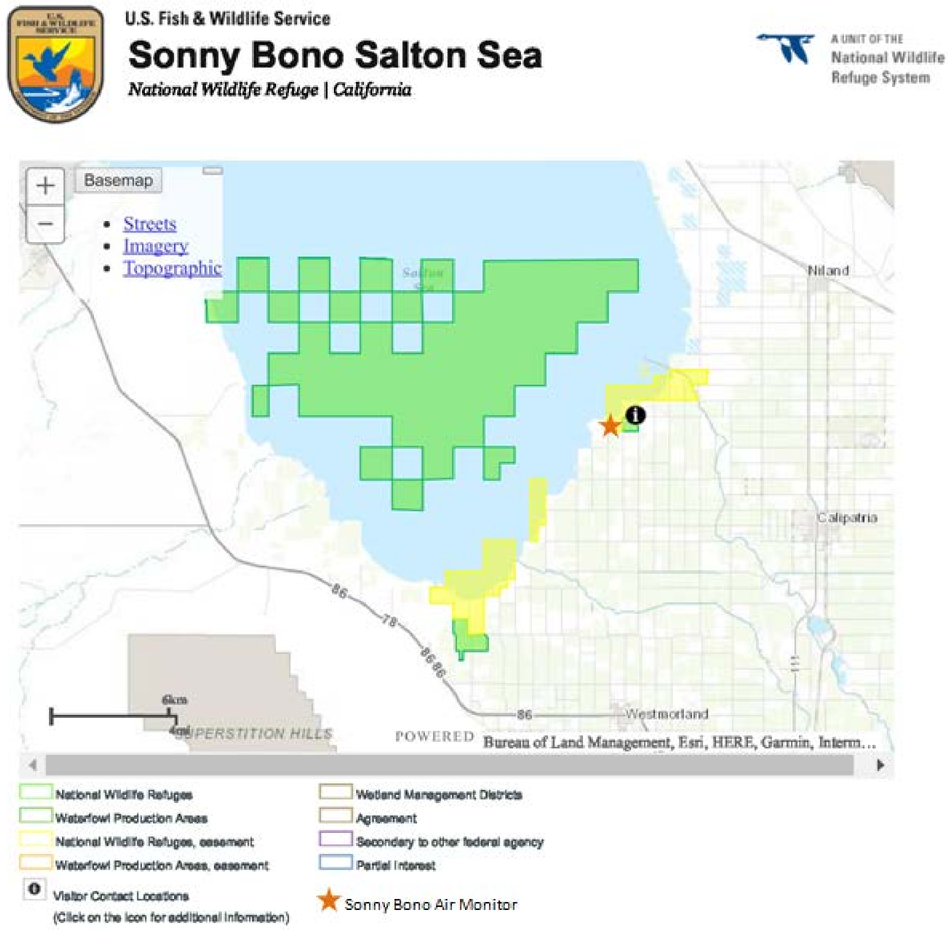


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
NOVEMBER 2, 2015

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} (µg/m³) Avg	1-hr PM_{10} (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					128	825	1900		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	-	-	-	15.7	2000
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	88	-	-	18.4	1900
		BAM 1020					90	442	1800		
Niland-English Road	ICAPCD	Hi-Vol Gravimetr	06-025-4004	(81102)	13997	-57	39	-	-	28.1	2000
		BAM 1020					131	841	1700		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	179	-	-	10.1	1900
		BAM 1020					117	503	1600		
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	-	-	-	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	131	931	1800	-	-
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	49	203	2100	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

***Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

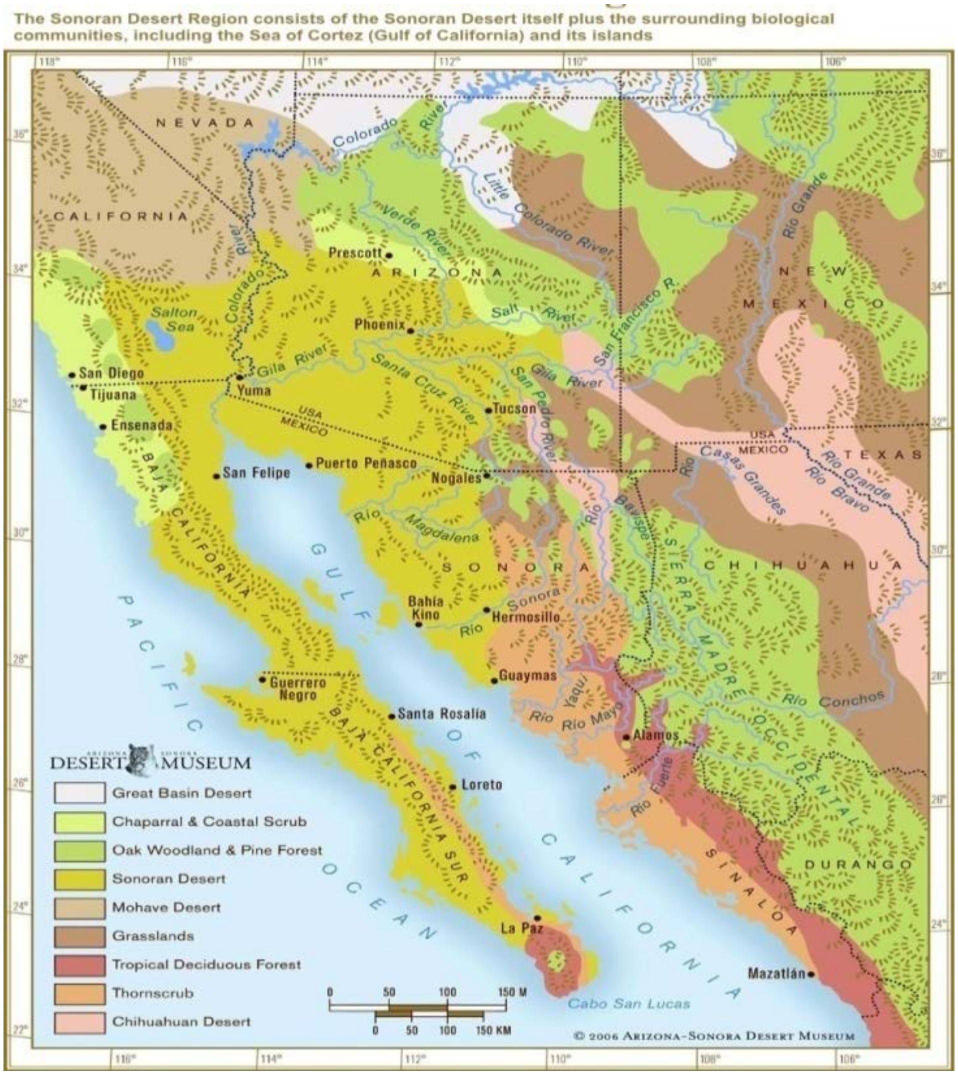


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 3.11” (**Figure 2-16)**. During the 12-month period prior to November 2, 2015, Imperial County recorded total annual precipitation of 1.97 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

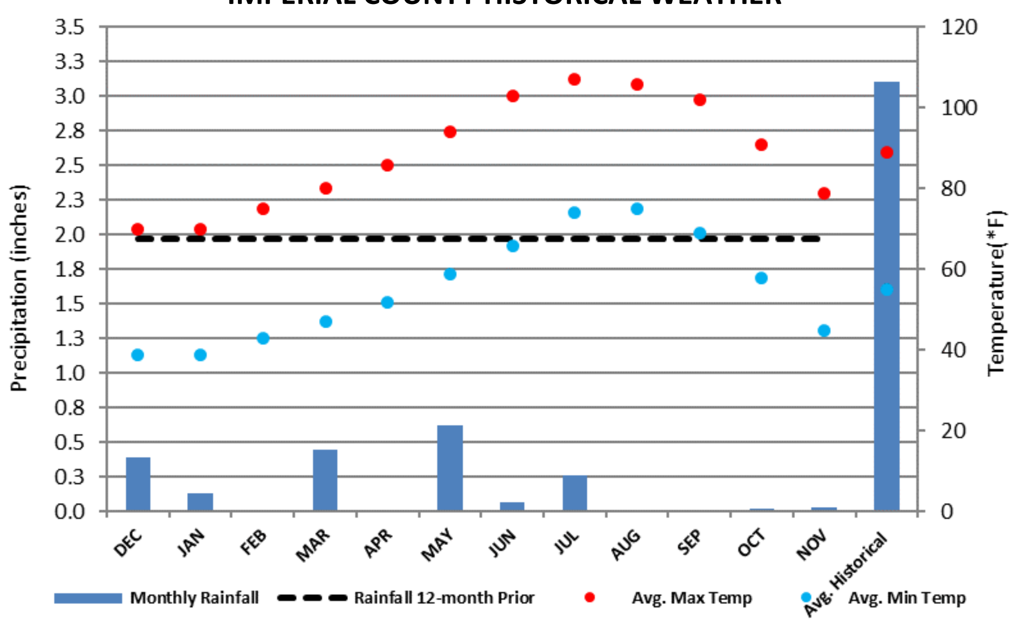


Fig 2-16: Historical Imperial County weather. Prior to November 2, 2015, the region suffered abnormally low total annual precipitation of 1.97 inches. Average annual precipitation is 3.11 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground
https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for November 2, 2015, caused by a passing low-pressure trough, brought strong and gusty winds from the mountain crests east and northeast and onto the desert slopes within the San Diego Mountains and Valleys. As the surface pressure gradients strengthened onshore, the trough and associated cold front over the northeast Pacific approached northern California then moved inland southeast and into Southern California. As the trough moved inland, onshore pressure gradients continued to strengthen resulting in strong and gusty westerly winds and evening rain.

Both the San Diego and Phoenix NWS offices discuss the incoming strong Pacific low-pressure system but unlike the San Diego NWS office, the Phoenix NWS office primarily discusses the forecast impact a day later (November 3, 2015) and only for the Arizona area. The anticipation of the gusty westerly winds caused the San Diego NWS office to issue the first of seven Urgent Weather Messages containing wind advisories for the San Diego Mountains and deserts

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

November 1, 2015 at 158pm PST. The Phoenix NWS office issued its first of three Urgent Weather Messages containing blowing dust advisories at 702pm PST (802pm MST) November 2, 2015.

Finally, one may discern the regional effect of the weather system along with the associated winds by reviewing the issued Public Information Statement by the San Diego NWS, which identified both wind speeds and peak wind gusts. The report issued November 2, 2015 at 738pm PST identified the Coachella Valley, the San Diego Mountains including Campo and Boulevard, the San Diego deserts including In Ko Pah and Borrego Springs as well as other areas in Riverside and San Bernardino. The report identified the max wind speeds for these areas as ranging between 33 mph to 41 mph. Peak wind gusts for these areas ranged between 36 mph and 59 mph, according to the NWS report.

On November 2, 2015, a passing Pacific low-pressure system and associated cold front caused gusty westerly winds to blow over and through the San Diego Mountains, over natural open desert areas and into Imperial County affecting air quality and causing an exceedance at the Westmorland monitor.

Figures 2-17 through 2-21 provide information regarding the incoming Pacific weather system, low-pressure and cold front, the tightening of the pressure gradient and the wind speeds.

FIGURE 2-17
LOW PRESSURE MOVES INTO THE REGION

Fig 2-17: The issued weather story by the San Diego NWS office on November 2, 2015. The image illustrates the movement of the low-pressure towards Southern California. Source: NWS San Diego Forecast https://www.weather.gov/sgx/#

FIGURE 2-18
UPPER LEVEL LOW MOVES INLAND

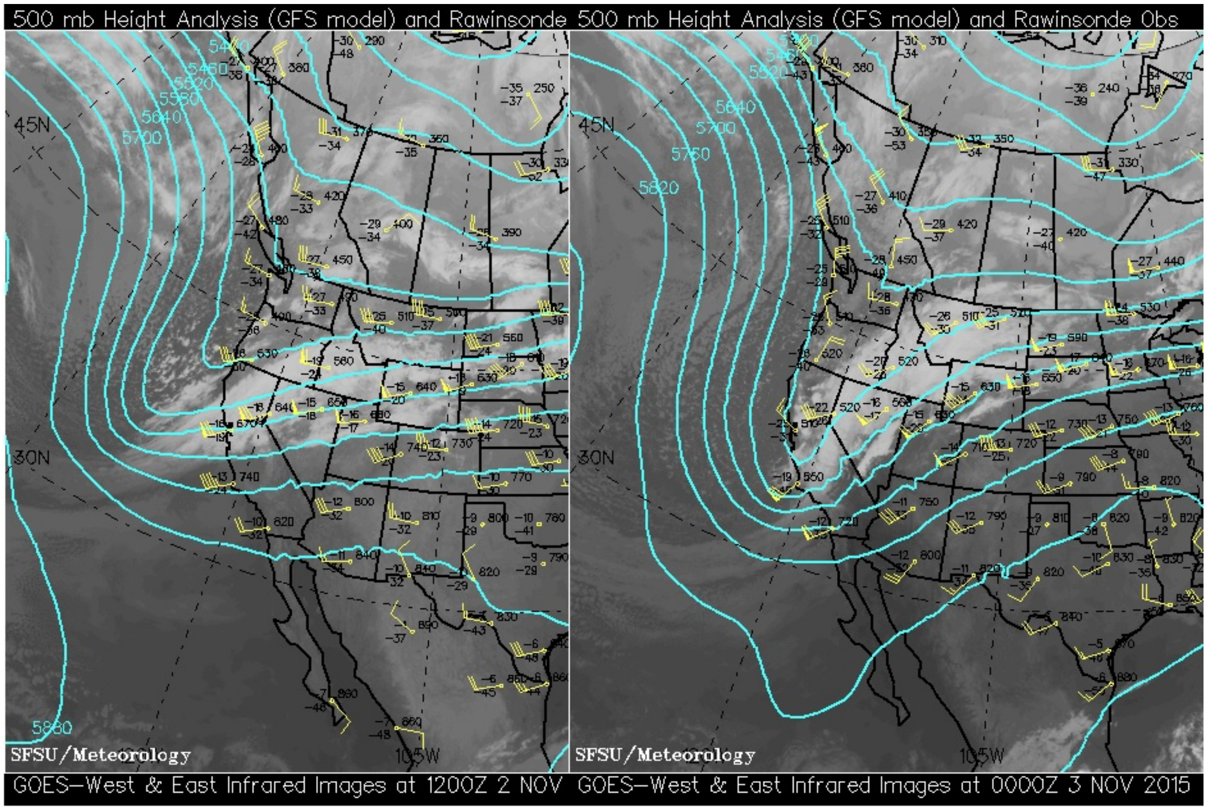


Fig 2-18: GOES E-W infrared satellite images captured on November 2, 2015. The left image captured at 0400 PST and the right image captured at 1600 PST show the upper-level trough moving inland over the region. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_500/1511

FIGURE 2-19
COLD FRONT MOVES IN

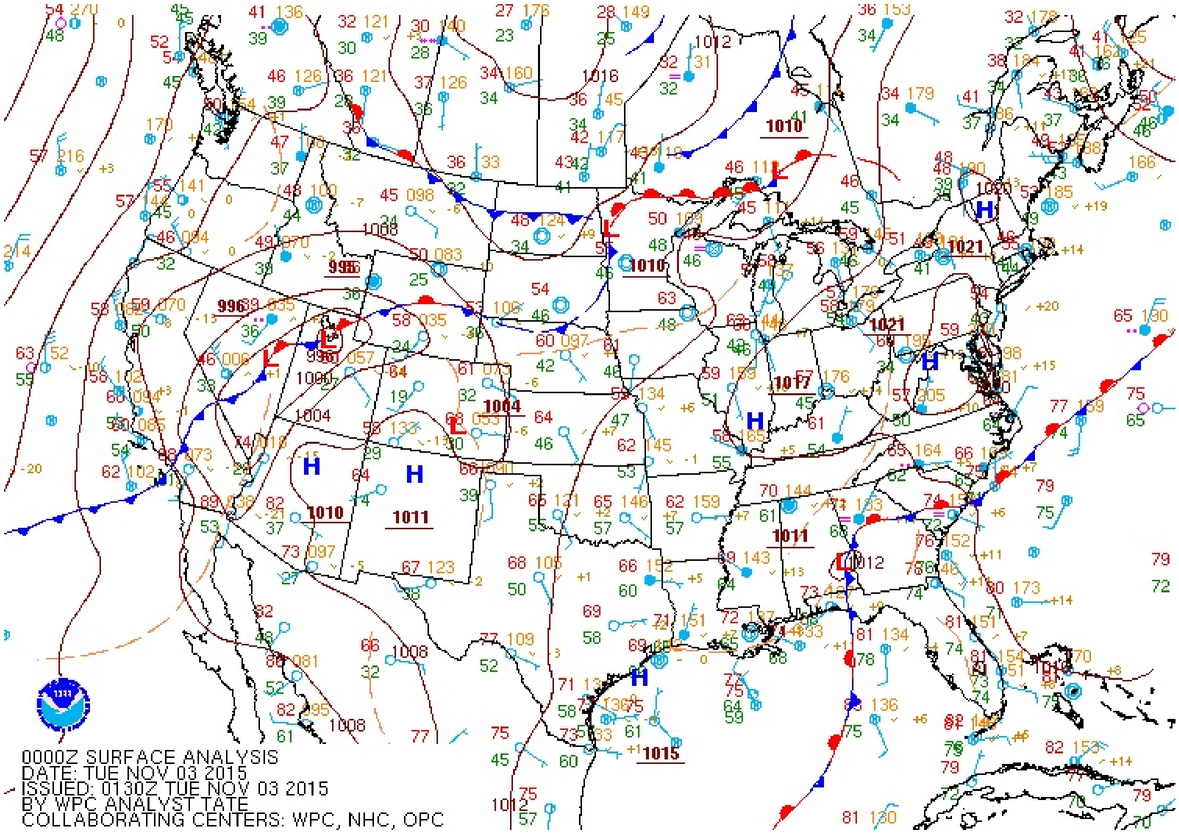


Fig 2-19: A surface analysis map shows a surface low situated over Nevada plus a cold front moving through the region. Source: WPC Surface Analysis Archive; http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

FIGURE 2-20
TIGHTENING SURFACE GRADIENT

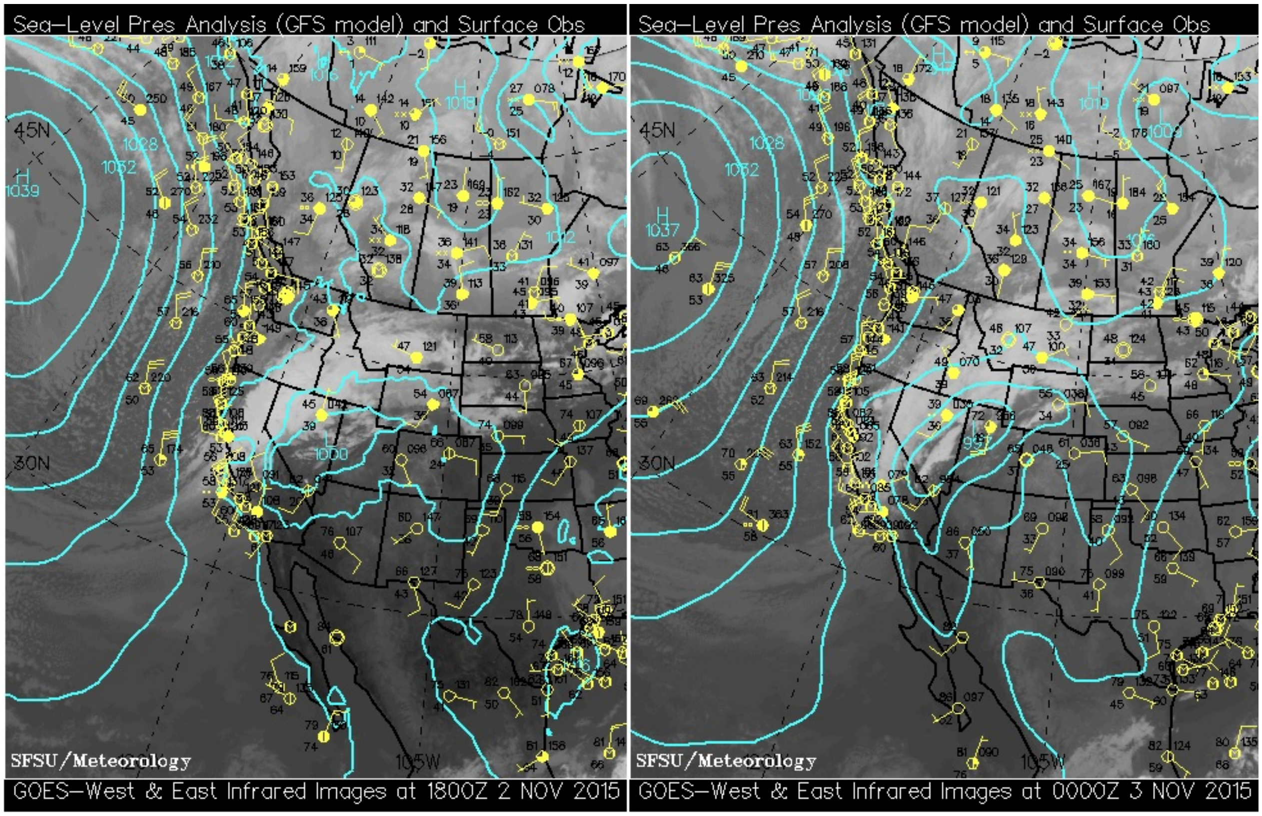


Fig 2-20: The image depicts the tightening of the surface gradient at 1000 PST (left) and 1600 PST (right) on November 2, 2015. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1511

FIGURE 2-21
GOES-W INFRARED SATELLITE IMAGE NOVEMBER 2, 2015

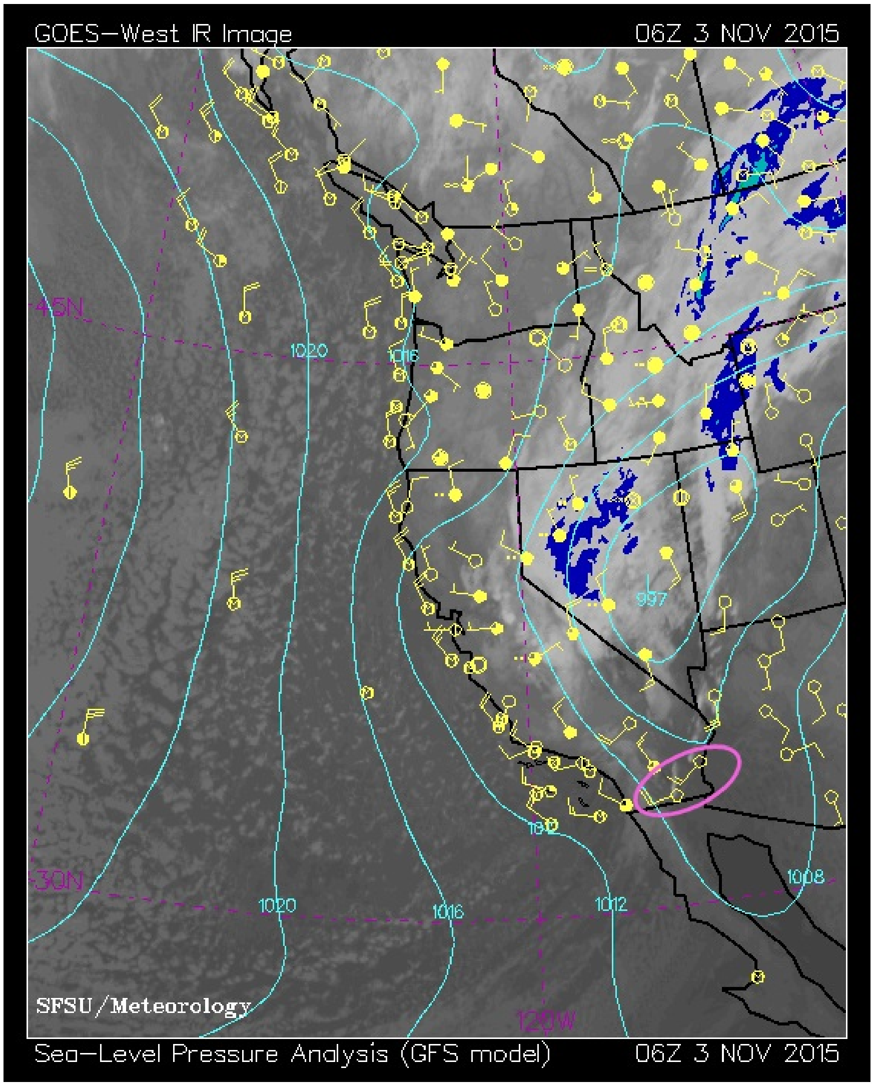


Fig 2-21: A GOES-W infrared satellite image (2200 PST November 2, 2015) shows winds ~21-25 mph over southeastern California coincident with the hour when winds begin to decrease. Surface wind stations measured winds that were much stronger. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_500/1511

As discussed above, both the San Diego and Phoenix NWS offices discussed the incoming strong Pacific low-pressure system but unlike the San Diego NWS office, the Phoenix NWS office primarily discussed the forecast impact for a day later (November 3, 2015) and only for the Arizona area. During the early morning hours of November 2, 2015, forecast discussions by the San Diego NWS office described partly cloudy and cooler temperatures as the high pressure weakened aloft, and the low-pressure trough approached from the Northwest. The forecast discussion described the trough and associated cold front as moving southeast across California reaching Southern California during the evening hours of November 2, 2015. Because of the anticipation of the prefrontal gusty winds within the mountains and deserts, the San Diego NWS office issued seven Urgent Weather Messages containing wind advisories for the San Diego Mountains and deserts as early as November 1, 2015. The evening forecast discussion issued by the San Diego NWS described a strong onshore flow and a deeper marine layer brought on by a deep low-pressure. These conditions brought cooler temperatures 10-15 degrees, rain and the continuance through early Tuesday, November 3, 2015 of strong west to southwest winds over the mountains and deserts. As evening approached, the Phoenix NWS office issued its first of three Urgent Weather Messages containing blowing dust advisories at 702pm PST (802pm MST) November 2, 2015.

As mentioned above, according to a released Public Statement by the San Diego NWS, max wind speeds for Coachella Valley, the San Diego Mountains, including Campo and Boulevard, the San Diego deserts including In Ko Pah and Borrego Springs ranged between 33 mph and 41 mph. Peak wind gusts measured between 36 mph and 59 mph.

Locally, at both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) winds remained calm until approximately noon. As winds shifted to a predominantly west direction, after the noon hour, winds increased through the evening hours. Both local airports measured winds in excess of 25 mph by approximately 500pm. KNJK measure 36 mph at 1756 PST while KIPL measured 30 mph at 1853 PST. KNJK reported blowing dust for three hours (1756 PST to 1956 PST) while KIPL reported haze for three hours (1853 PST to 2006 PST) coincident with the highest measured wind speeds 30 mph to 43 mph.

November 2, 2015 was a scheduled sampling day for the FRM samplers. Of the five existing samplers only the Brawley, Niland and Westmorland samplers collected valid samples, with the Westmorland sampler measuring an exceedance. The El Centro and Calexico samplers failed sampling protocols causing an invalidation of the samples. By contrast, all existing continuous BAM 1020 monitors in Imperial County measured elevated concentrations of particulate matter but fell short of measuring an exceedance. Direction, speed and duration of the winds provide information for the reasoned analysis discussed below that helps explain why only the Westmorland FRM sampler exceeded on November 2, 2015. **Figure 2-22** is a graphical illustration of the conditions that existed for the November 2, 2015 event.

FIGURE 2-22
RAMP UP ANALYSIS NOVEMBER 2, 2015

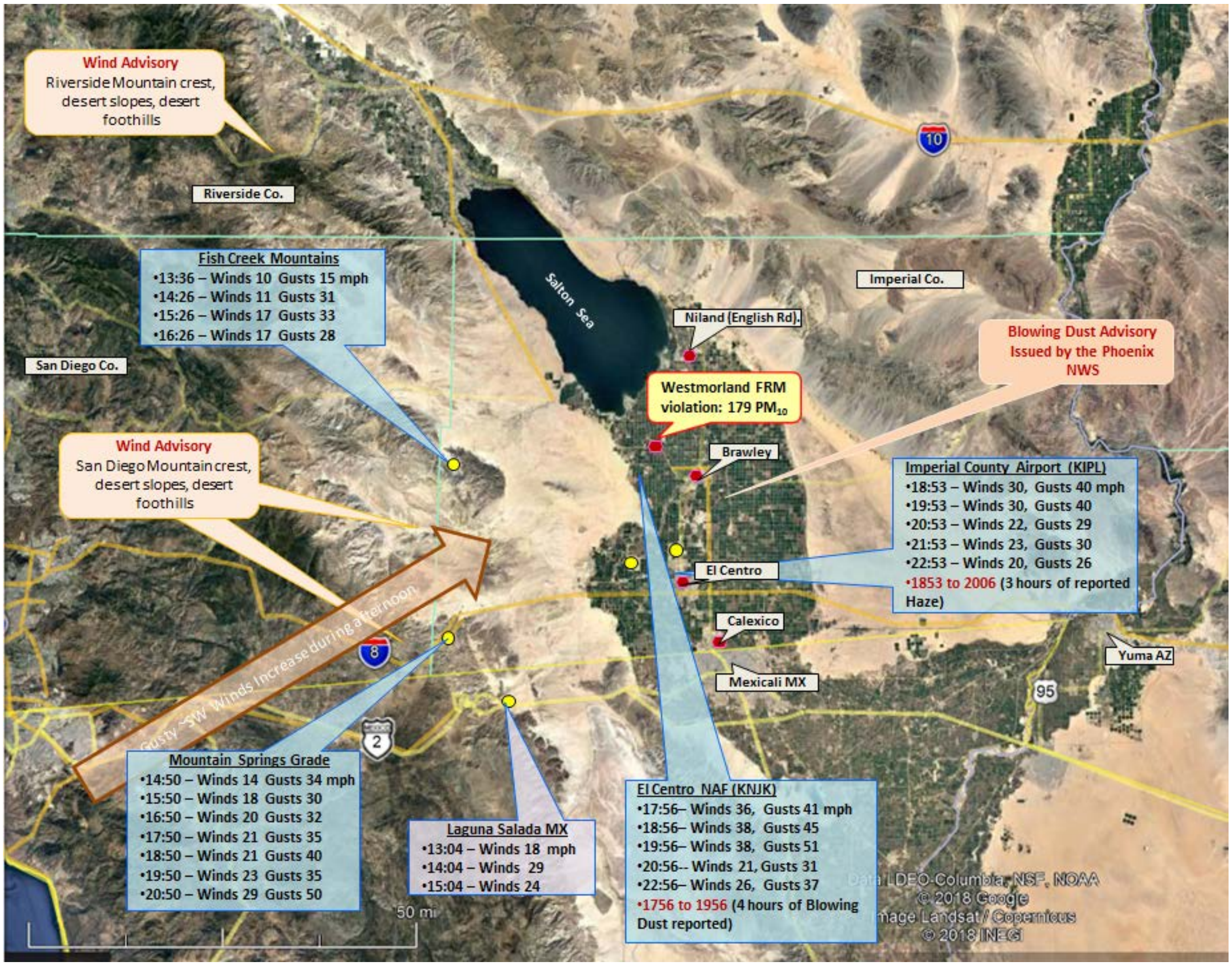


Fig 2-22: Meteorological conditions as described by both the San Diego and Phoenix NWS offices on November 2, 2015. The ramp-up analysis provides supporting evidence that a predominant shift in wind direction in a westerly direction coincident with elevated wind speeds and gusts on November 2, 2015 affected air quality causing an exceedance at the Westmorland monitor. Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON NOVEMBER 2, 2015

Station Monitor / Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed Wstmld	Brly	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	30	270	1853	41	2006	197	-	249
Naval Air Facility (KNJK)	38	270	1856	51	1956	197	-	249
Calexico (Ethel St)	15.7	278	2000	-	-	-	726	153
El Centro (9th Street)	18.4	270	1900	-	-	-	825	664
Niland (English Rd)	28.1	274	2000	-	-	-	726	153
Westmorland	10.1	251	1900	-	-	-	825	664
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	23	210	1252	-	-	80	35	114
Palm Springs Airport (KPSP)	30	330	2048	38	2048	-	726	153
Jacqueline Cochran Regional Airport (KTRM) - Thermal	23	350	2136	-	-	218	233	50
ARIZONA - YUMA								
Yuma MCAS (KNYL)	16	170	1457	24	2057	68	47	62
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	16.1	300	2000	-	-	-	726	153

*All time is in PST unless otherwise stated

National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[5] **Figures 2-23 through 2-25**, illustrate the path of airflow as it travelled from the mountains and natural open desert areas ending at 1200 PST, 1600 PST and 2300 PST. While surface measurements may differ between different measuring devices, the back trajectories allow for a general understanding of the path of airflow on November 2, 2015. As mentioned above by noon there is evidence that a shift in wind direction occurred. Both local airports measured a westerly direction from noon till about 2200 hours PST, coincident with elevated wind speeds and concentrations. Prior to the noon hour, as winds remained low, the airflow had a southeasterly flow at the 10 and 100 meters while the 500 meter airflow had a southwest flow. The 12-hour back-trajectory ending at 1600 hours PST, coincident with measured peak concentrations at the Westmorland monitor, confirms the westerly airflow at the Niland and Westmorland monitors. However, only the Westmorland monitor demonstrates a

[5] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

westerly airflow at all levels. The Niland monitor demonstrates a southerly airflow at the 10 and 100 meters. The El Centro and Calexico monitors illustrate a general west to south airflow. The back-trajectory ending at 2300 hours PST, when winds at local airports began to subside as did concentrations, airflow remained westerly for all stations.

Airflow prior to the noon hour was generally from a southerly direction. Of all the air monitoring stations measuring wind, the Niland station measured higher wind speeds. By 600 am PST Niland began measuring slightly higher winds than Westmorland, El Centro or Calexico. By 900 am PST Niland was measuring much higher winds than the local airports and other air monitoring stations. The higher winds at the Niland station provide some insight into the sporadic elevated concentrations at the Niland monitor prior to the noon hour. By 1600 PST airflow at the Westmorland monitor, unlike the other monitors had a predominant west direction, coincident with elevated wind speeds at local airports. The shift in airflow between the hours of 1600 PST and 2300 PST allowed for windblown dust to affect monitors in Imperial County affecting air quality and causing an exceedance on November 2, 2015. It should be noted that modeled winds can differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-23
HYSPLIT BACK TRAJECTORY MODEL
ENDING NOON ON NOVEMBER 2, 2015

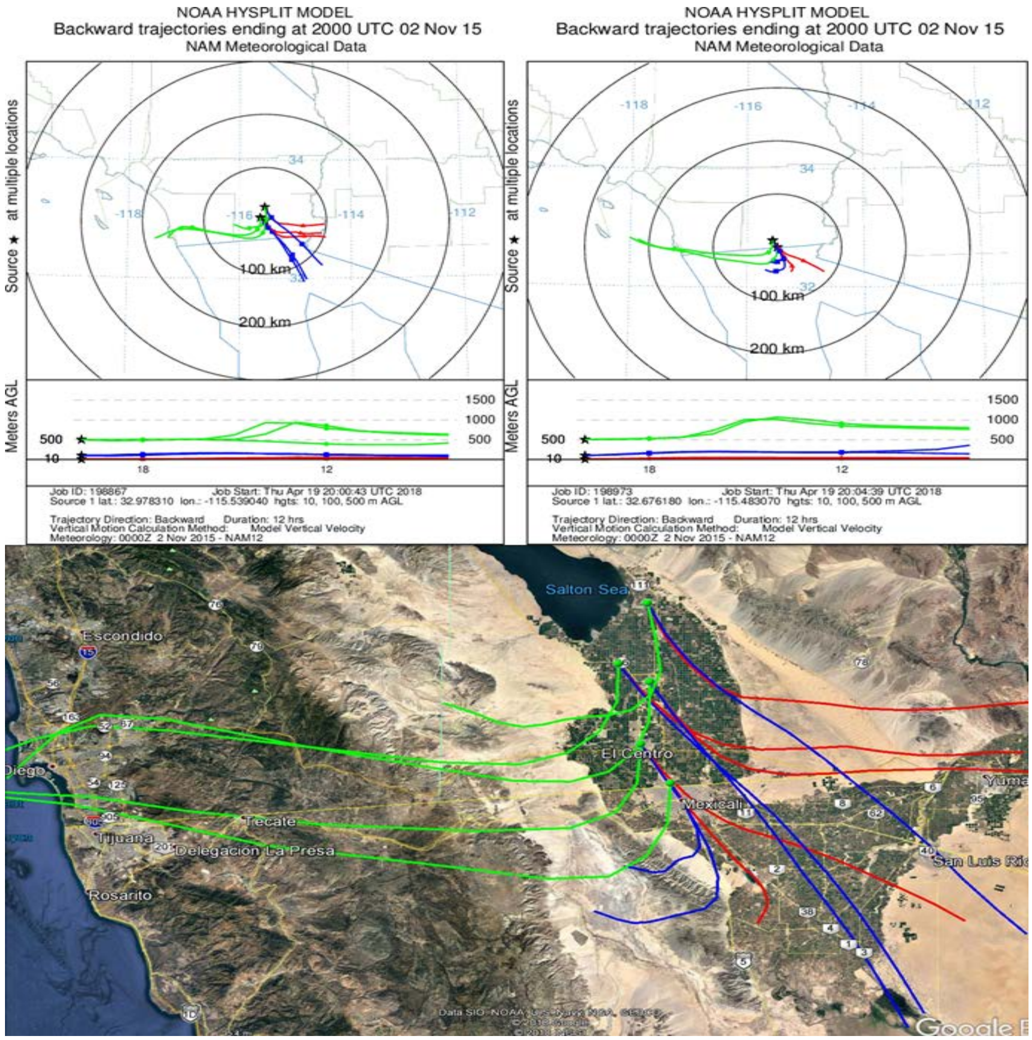


Fig 2-23: 12-hour back trajectories ending at 1200pm PST. The top right image represents Brawley, Niland and Westmorland while the top left image is El Centro and Calexico. The bottom image is the same back-trajectory as a base map for all the monitors. Twelve hours up to the noon hour shows airflow at the 10 and 100 meters from a south, southeast direction while the 500-meter airflow shows a southwest direction. Prior to the noon hour all stations measured relatively low concentrations. Niland measured four hours including the noon hour of elevated concentrations. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 meters AGL; and green indicates airflow at 500 meters AGL. Dynamically generated through NOAA Air Resources Laboratory HYSPLIT model

FIGURE 2-24
HYSPLIT BACK TRAJECTORY MODEL
ENDING AT 1600 PST ON NOVEMBER 2, 2015

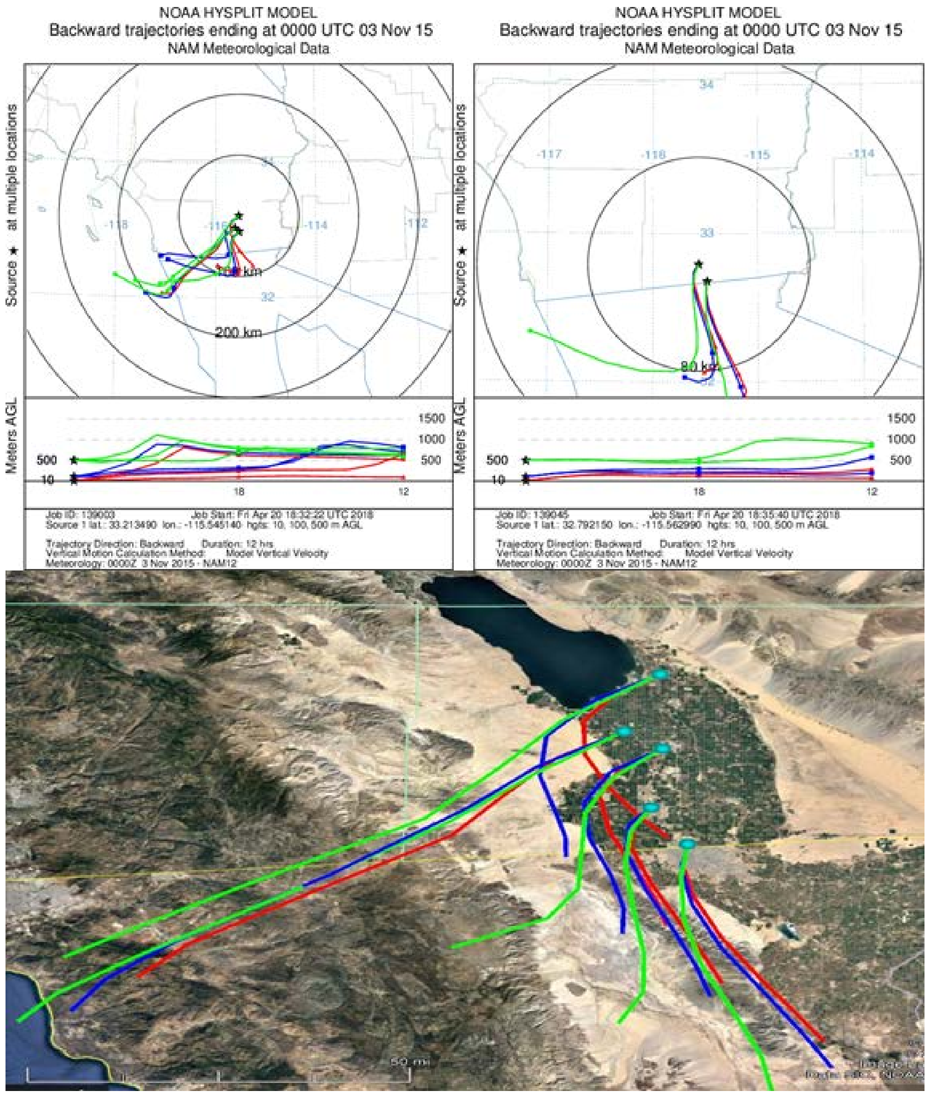


Fig 2-24: A 12-hour back trajectory ending at 16:00 PST. The top left image represents Niland, Brawley and Westmorland and the top right image represents El Centro and Calexico. The bottom image is a six-hour back-trajectory showing all monitors. Note that Westmorland is the only monitor with a strong airflow path from the southwest at all levels. While Niland has a southwest airflow at the 500-meter level, the 10- and 100-meter levels have a stronger southerly airflow. The El Centro and Calexico monitors have a stronger southerly airflow at all levels. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 meters AGL; and green indicates airflow at 500 meters AGL. Dynamically generated through NOAA Air Resources Laboratory HYSPLIT model

FIGURE 2-25
HYSPLIT BACK TRAJECTORY MODEL
ENDING AT 2300 PST ON NOVEMBER 2, 2015

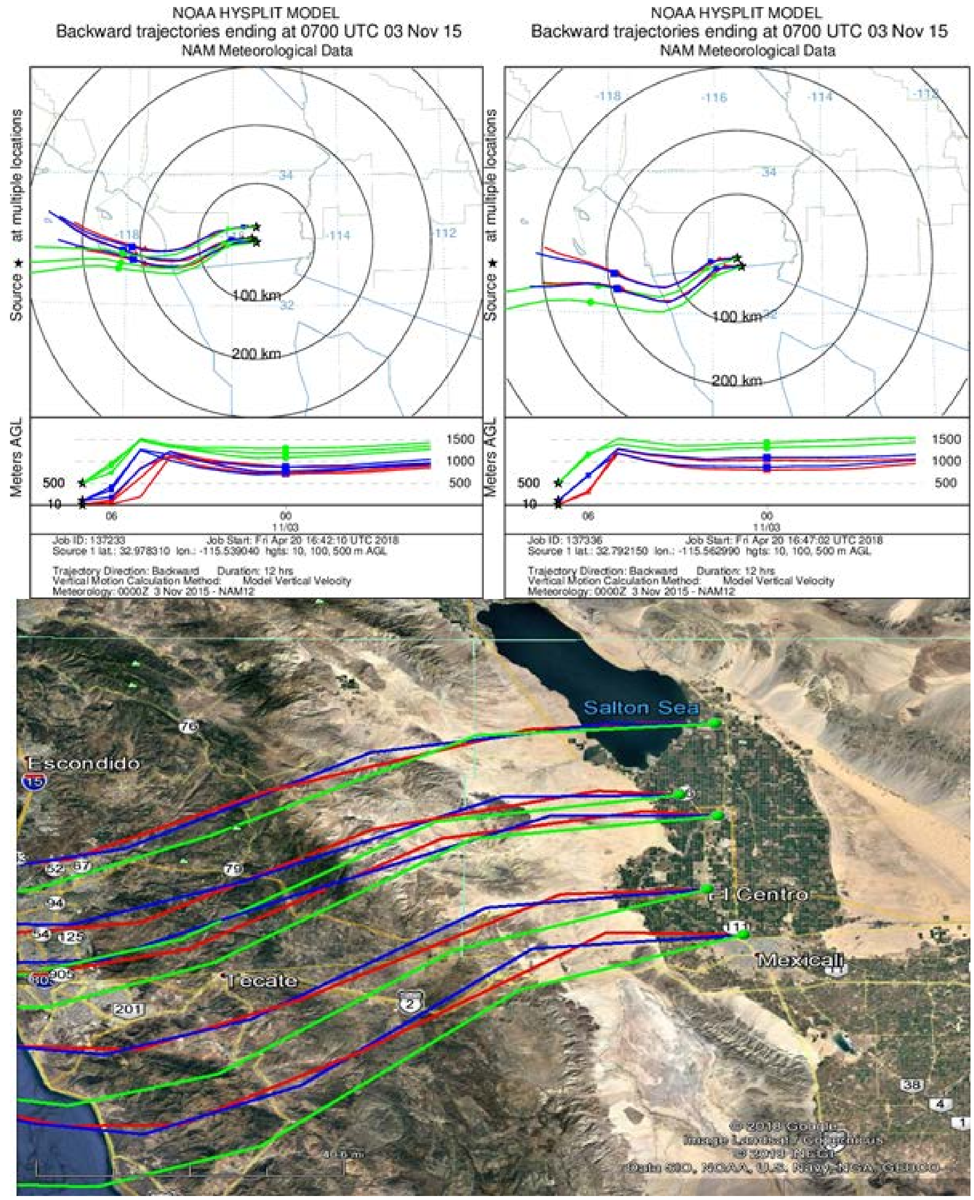


Fig 2-25: 12-hour back trajectories ending at 2300pm PST. The top right image represents Brawley, Niland and Westmorland while the top left image is El Centro and Calexico. The bottom image is a base map of the same back trajectory showing all the stations. Twelve hours up to the 2300 PST hour shows a predominant westerly airflow and well above surface level. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 meters AGL; and green indicates airflow at 500 meters AGL. Dynamically generated through NOAA Air Resources Laboratory HYSPLIT model

Figures 2-26 and 2-27 depict wind speeds[6] and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma counties for a total of three days, November 1 through November 3, 2015. Elevated emissions transported into Imperial County affected the Westmorland monitor when gusty westerly winds, associated with a passing low-pressure trough and associated cold front over the northeast Pacific approached northern California then moved inland southeast and into Southern California. All monitors measured the highest elevated concentrations between 1600 PST and 2300 PST coincident with continual measured wind speeds and gusts above 25 mph, with more than one hour at or above 25pmh. As mentioned above, only the Westmorland FRM sampler exceeded the NAAQS.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[7] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the November 2, 2015 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

[6] National Weather Service; NOAA's Glossary – Wind Speed: The rate at which air is moving horizontally past a given point. It may be a 2-minute average speed (reported as wind speed) or an instantaneous speed (reported as a peak wind speed, wind gust, or squall)[http://w1.weather.gov/glossary/index.php?letter=w]

[7] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-26
72 HOUR WIND SPEEDS AT REGIONAL AIRPORTS

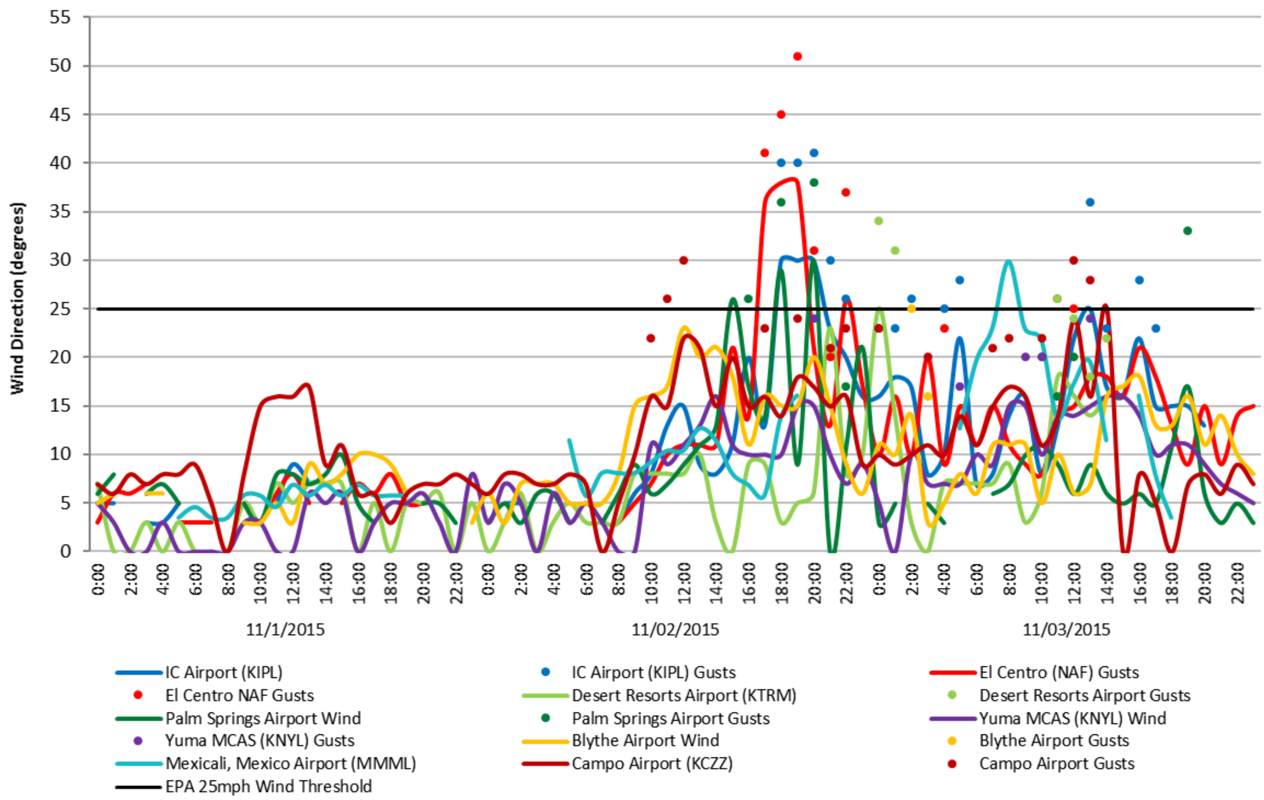


Fig 2-26: Is the graphical representation of the 72-hour measured winds speeds and gusts at various regional airports in California and Arizona. The graph illustrates the significant number of hours where measured wind speeds and wind gusts where above 25 mph. Immediate upstream sites like Campo, Imperial County Airport, and El Centro NAF had winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system

FIGURE 2-27

72 HOUR PM_{10} FLUCTUATIONS NEIGHBORING STATIONS

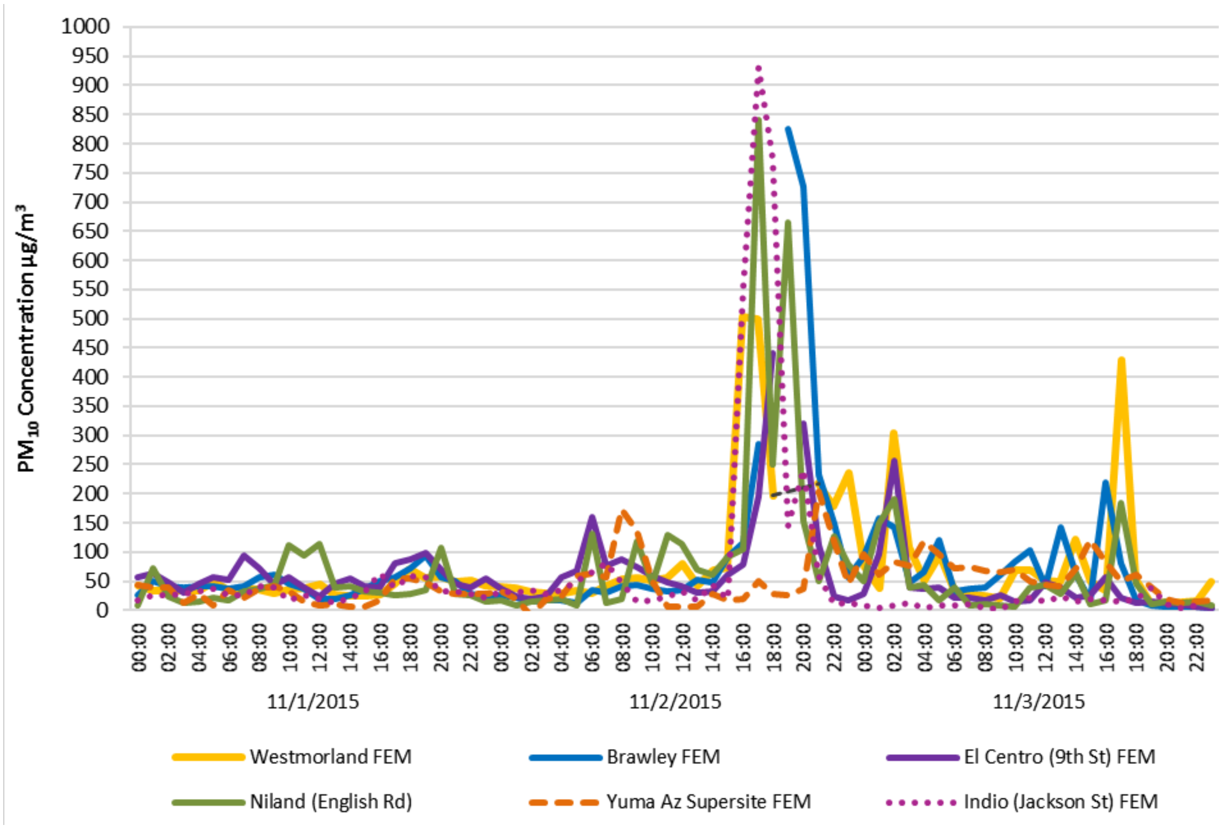


Fig 2-27: Is the graphical representation of the 72-hour relative PM_{10} concentrations at various monitoring locations throughout Riverside, Imperial, and Yuma Counties. The graph demonstrates that PM_{10} concentrations at monitors were affected by the passing of the weather system and accompanying winds on November 2, 2015. Air quality data from the EPA's AQS system

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Westmorland monitor on November 2, 2015, compared to non-event and event days demonstrates the variability over several years and seasons. The analysis also provides supporting evidence that there exists a clear causal relationship between the November 2, 2015 high wind event and the exceedance measured at the Westmorland monitor.

Figures 3-1 through 3-2 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Westmorland monitors for the period of January 1, 2010 through November 2, 2015. Note that prior to 2013, BAM data was not FEM therefore, not reported into AQS.[8] Properly establishing the variability of the event as it occurred on November 2, 2015, 24-hour averaged PM_{10} concentrations between January 1, 2010 and November 2, 2015 were compiled and plotted as a time series. All figures illustrate that the exceedance, which occurred on November 2, 2015, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[8] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO NOVEMBER 2, 2015

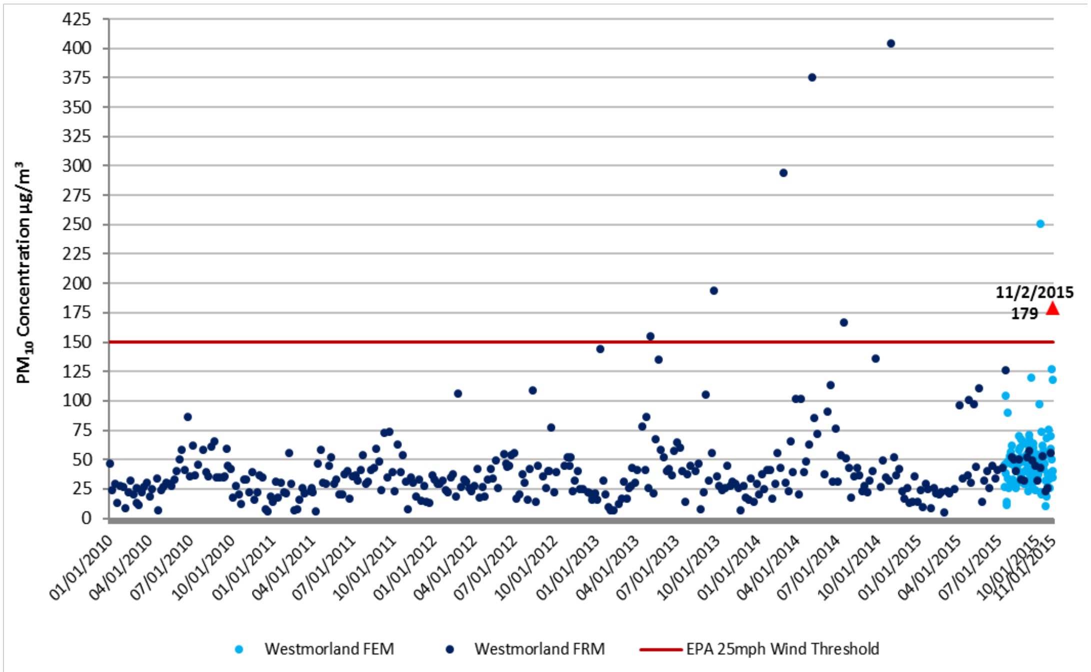
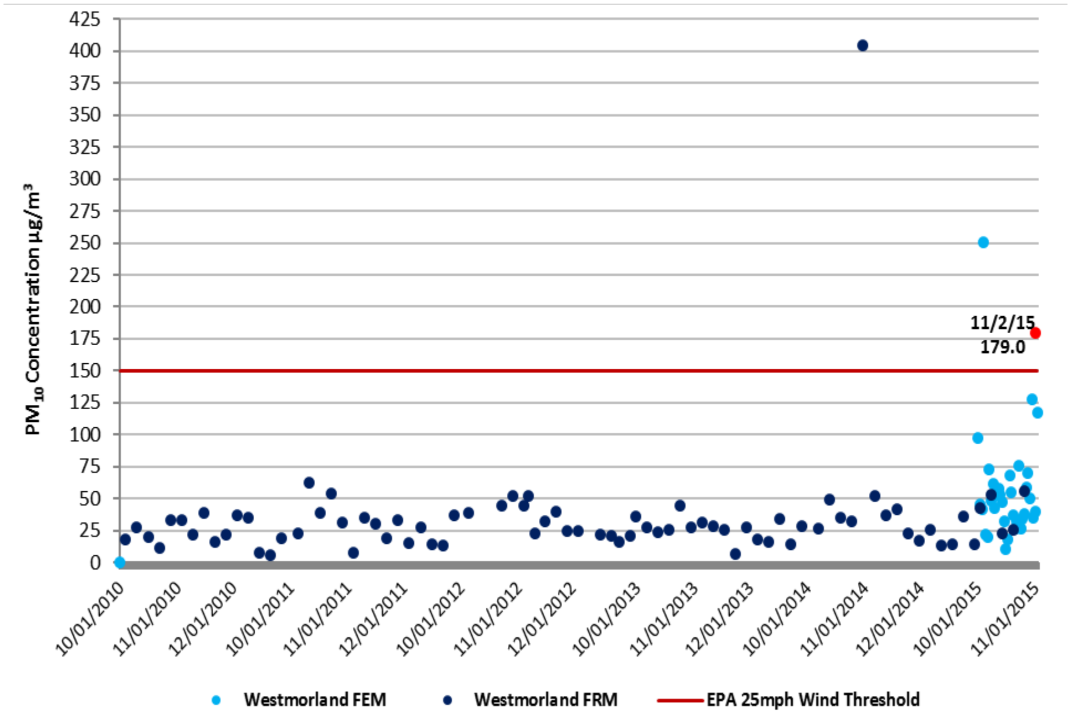


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 179 µg/m^3 on November 2, 2015 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 2103 sampling days there were 36 exceedance days which is less than a 2.0% occurrence rate

The time series, **Figures 3-1** for Westmorland includes 459 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and November 2, 2015. As mentioned earlier, the Westmorland BAM did not operate for the January 1, 2010 to July 14, 2015 period.

Overall, the time series illustrates that of the 460 sampling days there were a total of seven exceedance days that occurred during the time of January 1, 2010 through November 2, 2015. Of the total seven exceedance days, six days experienced individual FRM exceedances with no corresponding FEM exceedances. One of the FRM exceedance days occurred during the first quarter, one FRM exceedance day occurred during the second quarter, two exceedance days occurred during the third quarter, while the remaining three exceedances occurred during the fourth quarter. For FEM BAM and/or a combination of FRM/FEM measurements during the same time period there was one measured exceedance. This exceedance was recorded during the fourth quarter (October through December).

FIGURE 3-2
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 THROUGH NOVEMBER 2, 2015**



***Quarterly: October 1, 2010 through December 31, 2015 and October 1, 2015 through November 2, 2015**

Fig 3-2: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 179 µg/m^3 on November 2, 2015 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days

Figure 3-2 depicts the seasonal fluctuations over 112 sampling days at the Westmorland station for the months of October through December for the years 2010 to 2015 (2015 ending November 2). Of the 114 credible samples only three exceedances occurred. Like the historical concentrations, the seasonal concentrations show that the exceedance measured on November 2, 2015 falls outside the historical norm.

FIGURE 3-3
WESTMORLAND HISTORICAL
FRM AND FEM PM$_{10}$ 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO NOVEMBER 2, 2015

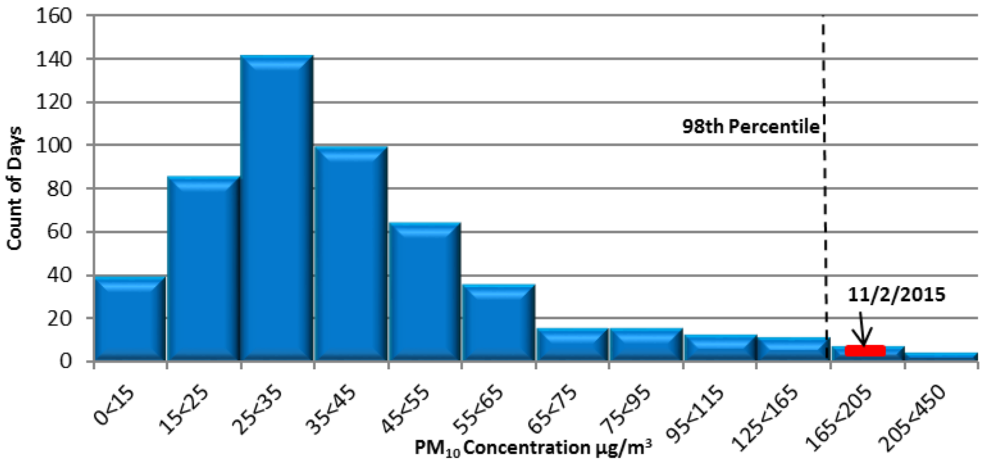
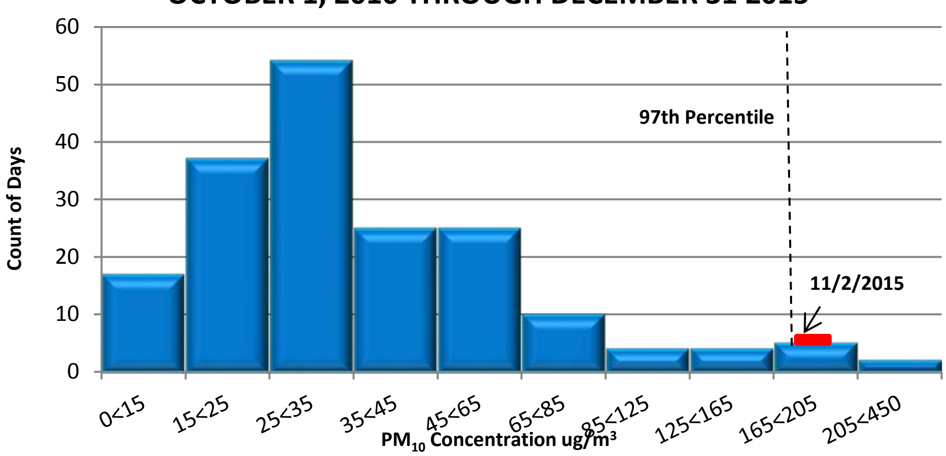


Fig 3-3: The 24-hr average PM$_{10}$ concentrations measured at the Westmorland monitoring site demonstrates that the November 2, 2015 event was in excess of the 98th percentile

FIGURE 3-4
WESTMORLAND SEASONAL
FRM AND FEM PM$_{10}$ 24 HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 THROUGH DECEMBER 31 2015**



***Quarterly: October 1, 2010 through December 31, 2015 and October 1, 2015 through November 2, 2015**

Fig 3-4: The 24-hr average PM$_{10}$ concentrations at the Westmorland monitoring site demonstrate that the November 2, 2015 event was in excess of the 97th percentile

Figures 3-3 and 3-4 represent percentile rankings for the Westmorland monitor over a historical and seasonal period. For the combined FRM and FEM annual 2010 through 2015 Westmorland dataset, the concentration of 179 µg/m^3 for Westmorland ise above the 97th or 98th percentile ranking.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on November 2, 2015 occurs infrequently. When comparing the measured PM_{10} levels on November 2, 2015 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Westmorland monitor was outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the November 2, 2015 natural event affected the concentrations levels at the Westmorland monitor causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedance on November 2, 2015 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for November 2, 2015. In addition, this November 2, 2015 demonstration provides technical and non-technical evidence that strong gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Westmorland monitor on November 2, 2015. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the November 2, 2015 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

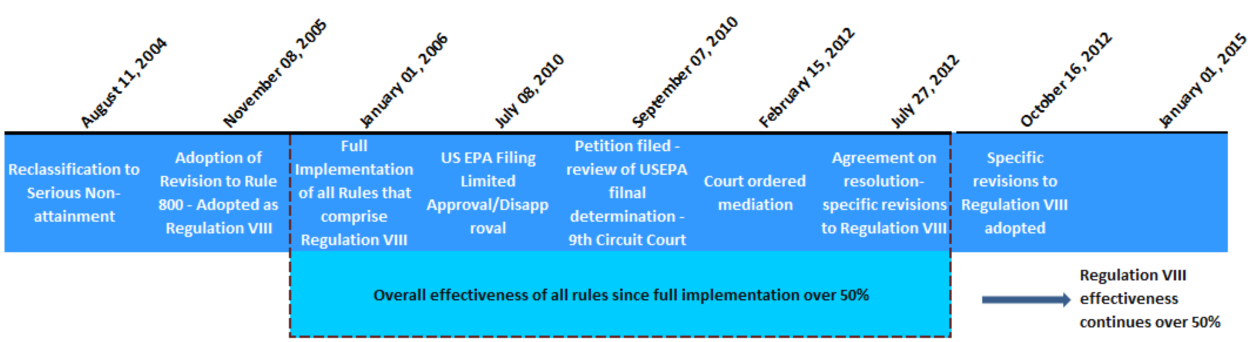


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

Below is a brief summary of Regulation VIII, which is comprised of seven fugitive dust rules. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four-quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is the Good Neighbor Policy. On November 2, 2015 the ICAPCD declared a Partial Burn day **(Appendix A).** There were no complaints filed for agricultural burning on November 2, 2015.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland, Niland, and Brawley during the November 2, 2015 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol

Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on November 2, 2015, officially declared a Partial Burn day, related to agricultural burning, waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

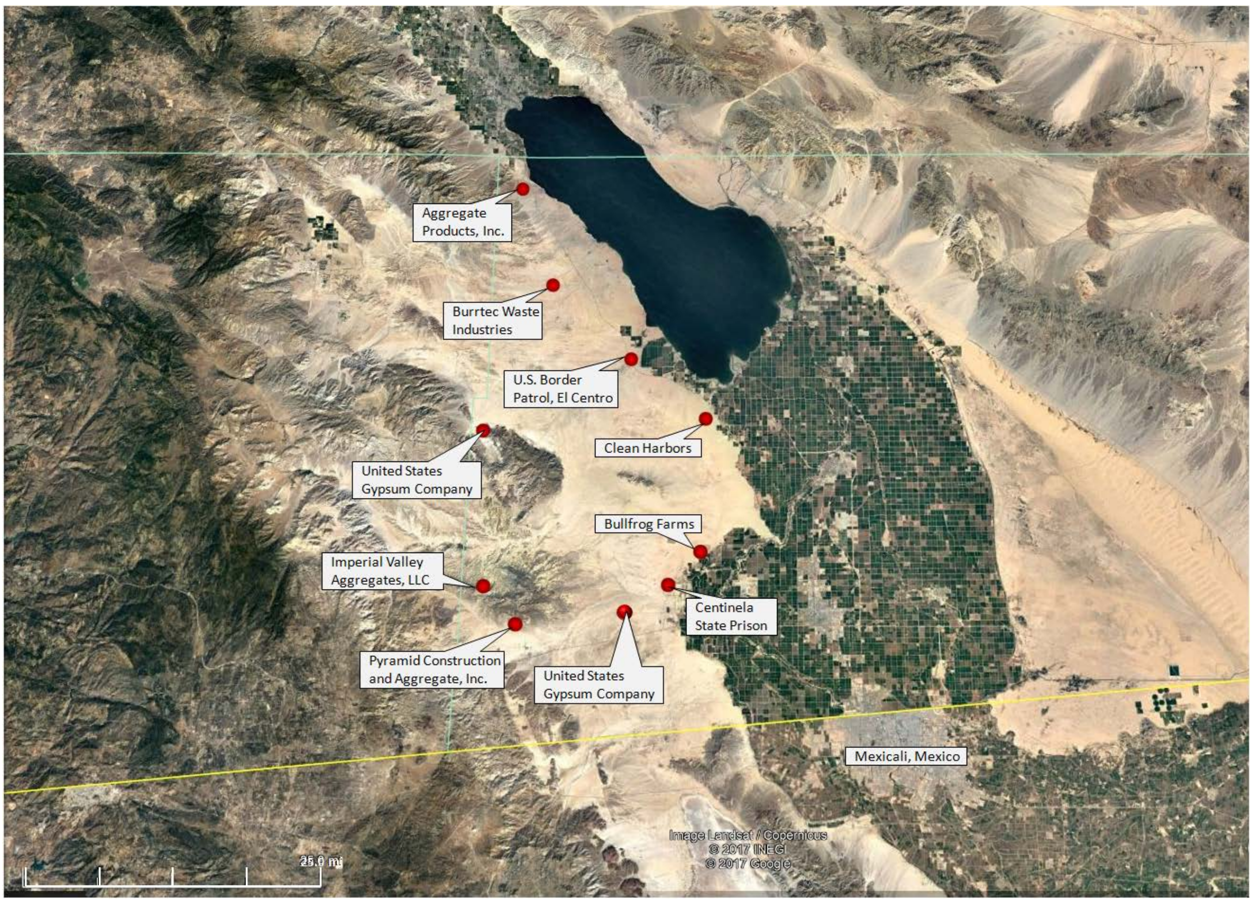


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

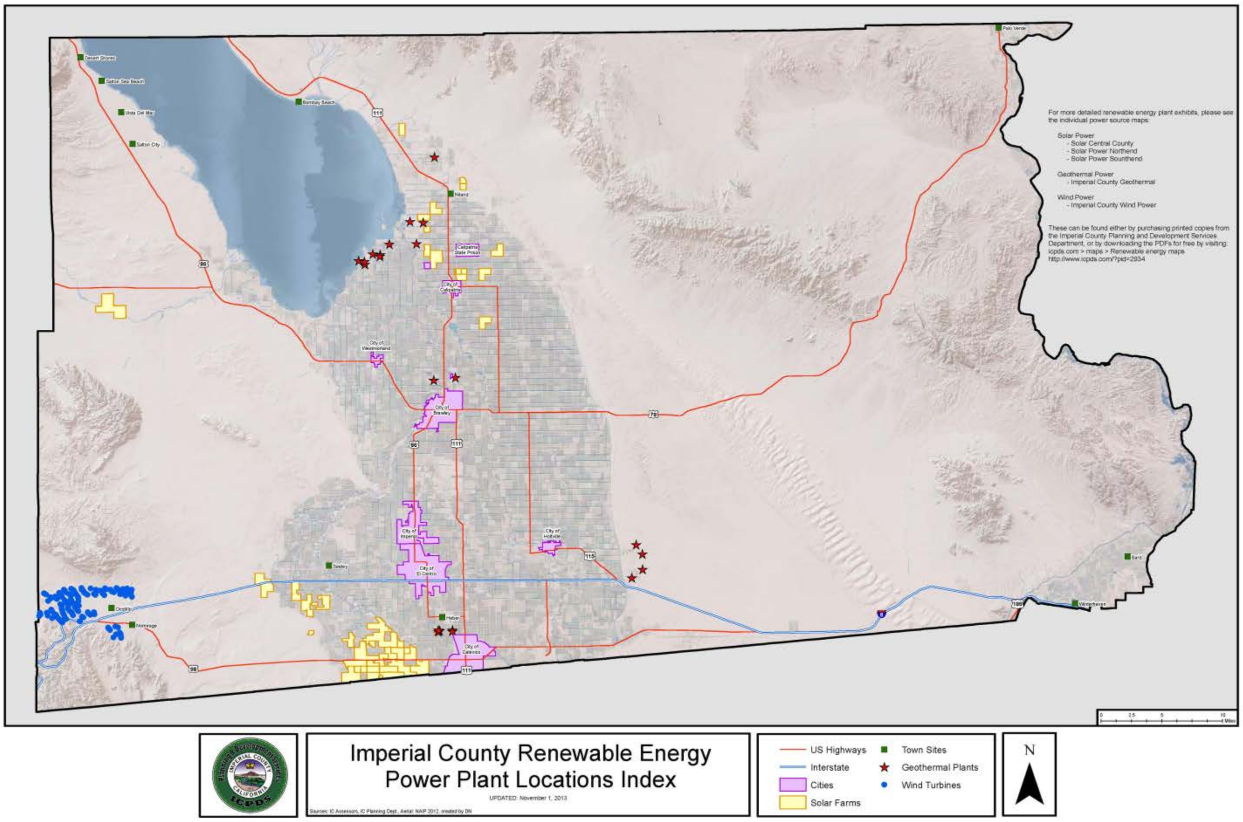


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Westmorland monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

During the early morning hours of November 2, 2015, forecast discussions by the San Diego NWS office described partly cloudy and cooler temperatures as the high pressure weakened aloft, and the low-pressure trough approached from the Northwest. The forecast discussion described the trough and associated cold front as moving southeast across California reaching Southern California during the evening hours of November 2, 2015. Because of the anticipation of the prefrontal gusty winds within the mountains and deserts, the San Diego NWS office issued seven Urgent Weather Messages containing wind advisories for the San Diego Mountains and deserts as early as November 1, 2015. The evening forecast discussion issued by the San Diego NWS described a strong onshore flow and a deeper marine layer brought on by a deep low-pressure. These conditions brought cooler temperatures 10-15 degrees, rain and the continuance through early Tuesday, November 3, 2015 of strong west to southwest winds over the mountains and deserts. As evening approached, the Phoenix NWS office issued its first of three Urgent Weather Messages containing blowing dust advisories at 702pm PST (802pm MST) November 2, 2015.

By late afternoon a Public Statement released by the San Diego NWS, identified max wind speeds for Coachella Valley, the San Diego Mountains, including Campo and Boulevard, the San Diego deserts including In Ko Pah and Borrego Springs ranged between 33 mph and 41 mph. Peak wind gusts measured between 36 mph and 59 mph.

Locally, at both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) winds remained calm until approximately noon. As winds shifted to a predominantly west direction, after the noon hour, winds increased through the evening hours.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Similarly, other data from automated meteorological instruments upstream from the Brawley, Westmorland, and Niland monitors during the wind event. Both local airports measured wind in excess of 25 mph by approximately 500pm. KNJK measure 36 mph at 1756 PST while KIPL measured 30 mph at 1853 PST. KNJK reported blowing dust for four hours (1756 PST to 1956 PST) while KIPL reported haze for three hours (1853 PST to 2006 PST) coincident with the highest measured wind speeds 30 mph to 43 mph. See also **Table 2-2**. Wind speeds of over 25 mph are normally sufficient to overcome most PM_{10} control measures. During the November 2, 2015 event, wind speeds were above the 25 mph threshold overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong cold front that moved through southern California entrained particulate matter that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements west of the Westmorland monitoring station during the event were high enough (at or above 25 mph, with wind gusts of 51 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on November 2, 2015 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The

November 2, 2015 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for November 2, 2015, identified a passing Pacific low-pressure system and associated cold front. The passing low-pressure trough brought strong and gusty winds from the mountain crests east and northeast and onto the desert slopes within the San Diego Mountains and Valleys. As the surface pressure gradients strengthened onshore, the trough and associated cold front over the northeast Pacific approached northern California then moved inland southeast and into Southern California. As the trough moved inland, onshore pressure gradients continued to strengthen resulting in strong and gusty westerly winds and evening rain.

As mentioned above, the Phoenix NWS office primarily focused its forecast discussion for November 3, 2015 and only for the Arizona area. However, the San Diego NWS office in anticipation of the gusty westerly winds preceding the weather system issued the first of seven Urgent Weather Messages containing wind advisories for the San Diego Mountains and deserts November 1, 2015 at 158pm PST. The Phoenix NWS office issued its first of three Urgent Weather Messages containing blowing dust advisories at 702pm PST (802pm MST) November 2, 2015. A Public Information Statement issued by the San Diego NWS identified both wind speeds and peak wind gusts within its service area including the Coachella Valley, the San Diego Mountains including Campo and Boulevard, the San Diego deserts including In Ko Pah and Borrego Springs as well as other areas in Riverside and San Bernardino. Max wind speeds for these areas ranged between 33 mph to 41 mph. Peak wind gusts for these areas ranged between 36 mph and 59 mph.

Locally, at both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) winds shifted to a predominantly west direction, after the noon hour, coincident with increased winds through the evening hours. Both local airports measured winds in excess of 25 mph by approximately 500pm. KNJK measure 36 mph at 1756 PST while KIPL measured 30 mph at 1853 PST. KNJK reported blowing dust for three hours (1756 PST to 1956 PST) while KIPL reported haze for three hours (1853 PST to 2006 PST) coincident with the highest measured wind speeds 30 mph to 43 mph.

Entrained windblown dust from natural areas, particularly from the desert area and anthropogenic sources controlled with BACM, is verified by the meteorological and air quality observations on November 2, 2015. Meteorological data show that these gusty westerly winds blew across the San Diego mountain slopes and natural open deserts were directly responsible for the high PM_{10} concentrations observed in Imperial County on November 2, 2015

Figures 5-1 through 5-3 provide information regarding the tightening of the surface gradient and the level of aerosols in the air on November 2, 2015.

FIGURE 5-1
SURFACE GRADIENT TIGHTENS

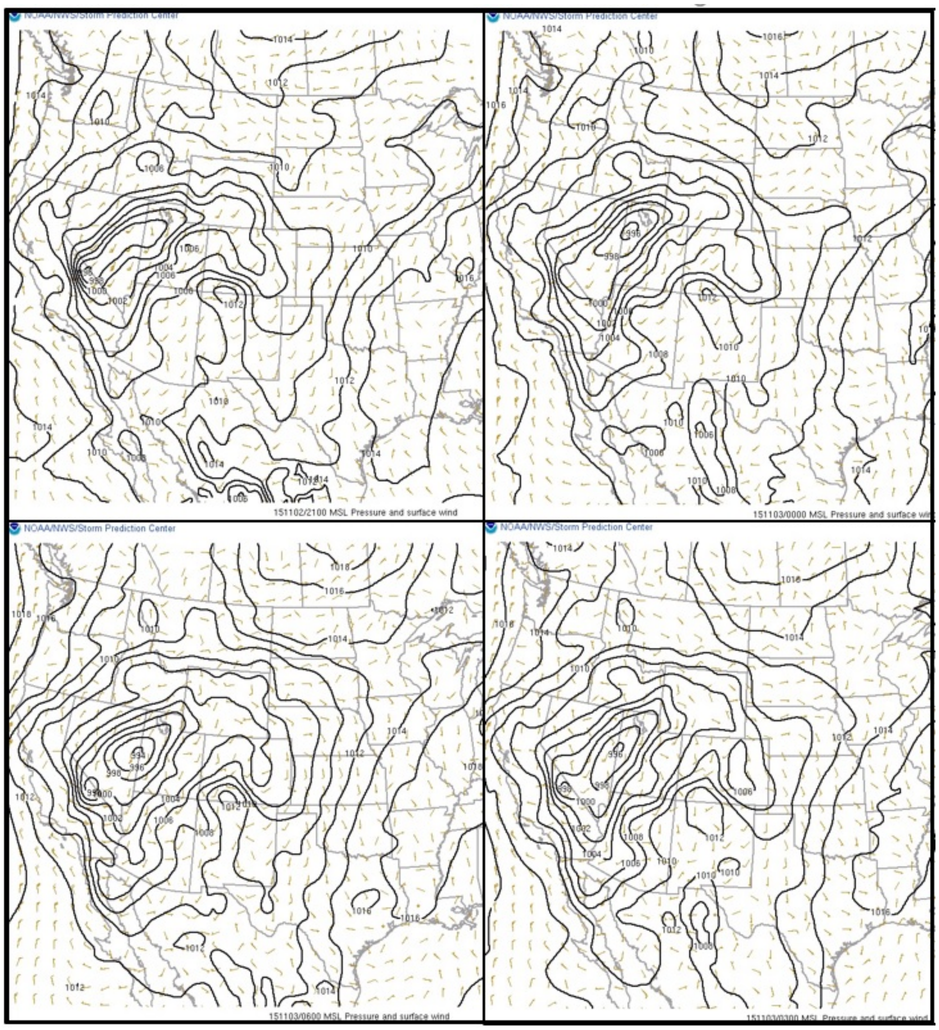


Fig 5-1: As the low pressure over Nevada strengthened, the surface gradient tightened. Clockwise, from top left: 1300 PST, 1600 PST, 1900 PST and 2200 PST. Source: Storm Prediction Center Archives; http://www.spc.noaa.gov/exper/archive/event.php

Figure 5-2 shows the Aerosol Optical Depth (AOD)[9] thickness over Imperial County at around 1330 PST as captured by the MODIS instrument[10] onboard the Aqua satellite. Although the

[9] **Aerosol Optical Depth (AOD**) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov.

[10] MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. MODIS Technical Specifications identify the Terra orbit at 10:30am and the Aqua at 1:30pm.

satellite made its pass before peak concentrations occurred, it does show a moderately heavy layer of aerosols transported across Imperial County.

FIGURE 5-2
AEROSOLS TRANSPORTED ACROSS SOUTHEAST CALIFORNIA

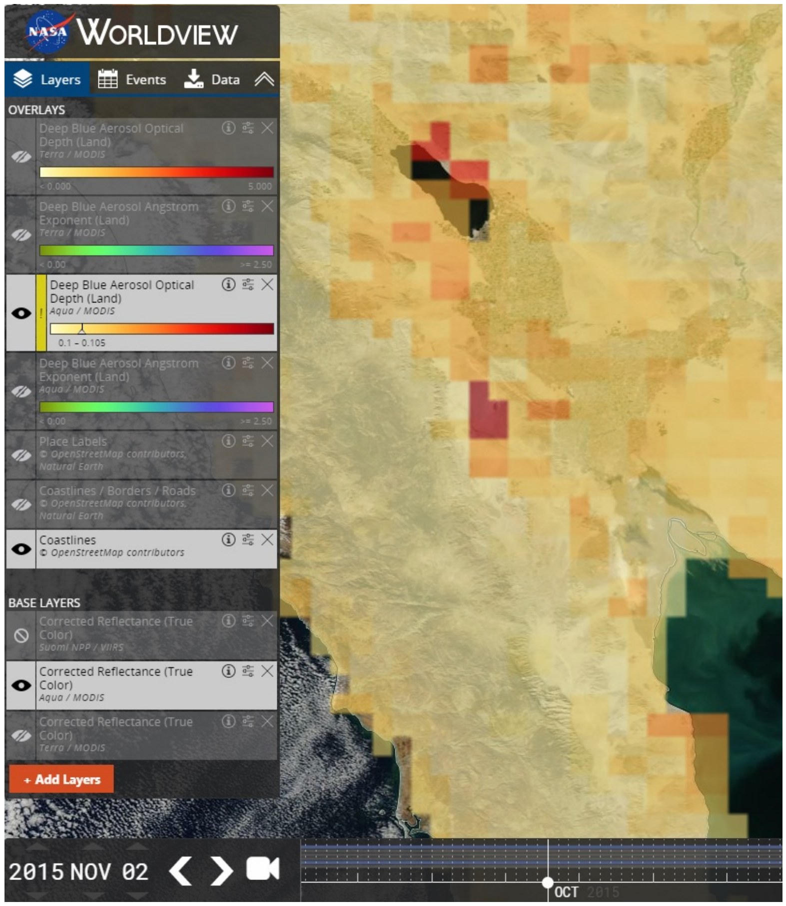


Fig 5-2: The image illustrates the Aerosols drifting across Imperial County during the afternoon of November 2, 2015. Warmer colors indicate a thicker AOD column. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

Figure 5-3 uses the Deep Blue[11] Angstrom Exponent[12] layer to differentiate the relative particle sizes of aerosols. This is useful in determining what aerosols are likely dust.

[11] The **Deep Blue Aerosol Optical Depth layer** is useful for studying aerosol optical depth over land surfaces. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths) where Dark Target approaches fail. Source: https://worldview.earthdata.nasa.gov.

[12] The MODIS **Deep Blue Aerosol Ångström Exponent layer** can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke). Source: https://worldview.earthdata.nasa.gov

FIGURE 5-3
DUST SIZED AEROSOLS OVER IMPERIAL COUNTY

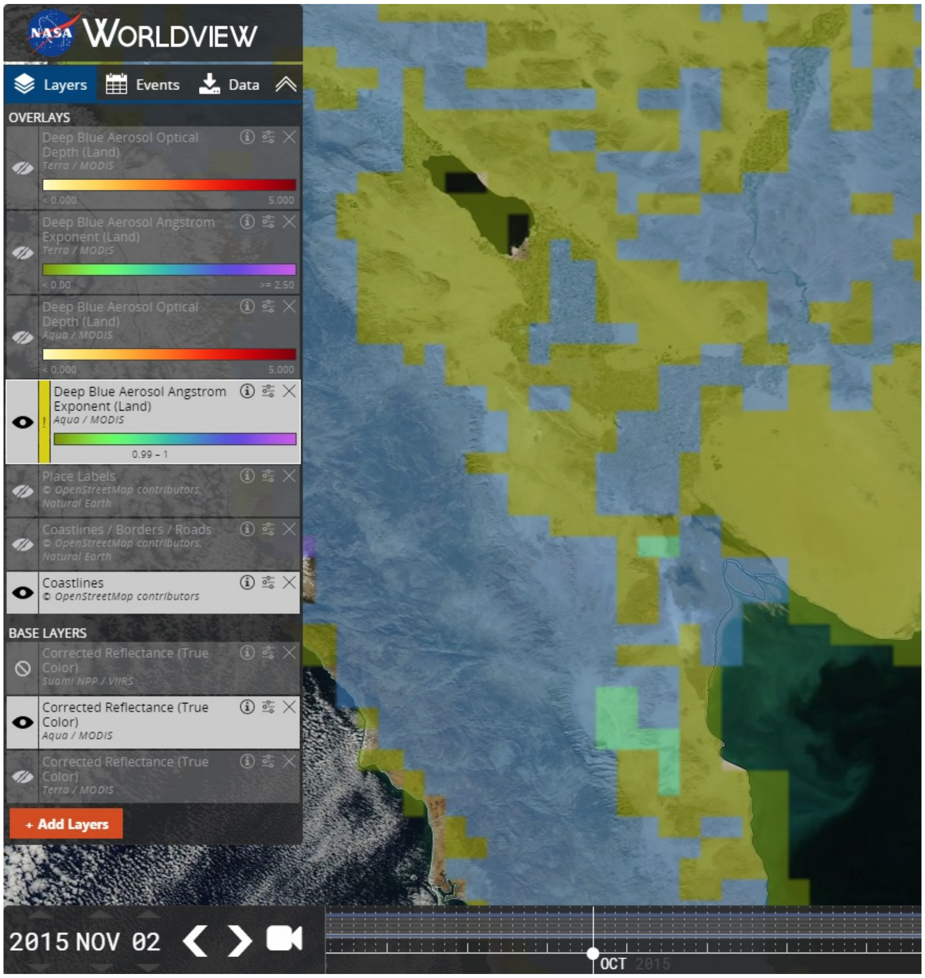


Fig 5-3: The MODIS instrument onboard the Aqua Satellite, captured dust-sized aerosols transported across Imperial County at ~1330 on November 2, 2015. Increasingly dark colors of green indicate increasingly large aerosols that are likely dust (see legend on left of image). Source: NASA Worldview; https://worldview.earthdata.nasa.gov

NOAA's smoke/dust text narrative further supports the observed possible dust in **Figures 5-2 and 5-3.** The smoke/dust narrative, valid through 1615 PST, describes several areas of blowing dust over the deserts of southern California (**Appendix A**).

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[13] **Table 5-1** provides a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at Westmorland. Although the FRM monitor measured the exceedance, the hourly concentrations of the FEM monitor are used as a relational support between the concentrations and the winds. The Westmorland monitor shows peak hourly

[13] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

concentrations following or during the period of high upstream wind speeds. The Mountain Springs Grade measured strong southwest winds blowing across and through the mountain passes of San Diego County, down the canyon/desert slopes along Interstate 8 and into the desert floor of Imperial County. The strong winds entrained windblown dust toward Westmorland, elevating concentrations sufficiently to cause an exceedance.

TABLE 5-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND NOVEMBER 2, 2015

	Mountain Springs Grade			Imperial County Airport (KIPL)			El Centro NAF (KNJK)				Fish Creek Mtns.			Westmorland
HOUR	W/S	W/G	W/D	W/S	W/G	W/D	W/S	W/G	W/D	Obs.	W/S	W/G	W/D	PM_{10} (µg/m³)
0:00	16	27	223			0			0		0	2		41
1:00	19	26	208	5		130			0		2	4	210	38
2:00	15	24	215	5		150			0		1	3	205	32
3:00	15	23	214			0			0		1	4	168	29
4:00	11	23	217	5		180	3		150		0	3		29
5:00	12	22	216			0			0		0	4		34
6:00	14	21	214			0			0		0	3		30
7:00	17	26	203			0			0		0	3		43
8:00	18	30	225	3		120	3		140		1	4	325	53
9:00	16	30	220	6		90	5		100		1	4	4	56
10:00	14	27	210	8		130	7		110		2	6	316	52
11:00	16	28	222	13		110	10		120		2	8	314	56
12:00	16	29	226	15		140	11		130		4	9	311	80
13:00	17	30	249	9		190	11		130		10	15	338	43
14:00	14	34	216	8		170	11		200		11	31	219	68
15:00	18	30	216	11		260	21		250		17	33	198	72
16:00	20	32	239	20		270	14		270		17	28	198	503
17:00	21	35	212	13		270	36	41	260	BLDU	5	26	207	499
18:00	21	40	219	30	40	270	38	45	270	BLDU	14	20	197	197
19:00	23	35	227	30	40	260	38	51	250	BLDU	4	19	195	
20:00	29	50	239	30	41	260	21	31	250		2	11	279	
21:00	22	39	209	23	30	260	13	20	220		4	17	43	218
22:00	22	35	221	20	26	240	26	37	230		1	13	166	178
23:00	25	41	236	16		270	17		240		4	16	9	236

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains (FHCC1) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees. Due to the different times during the hour that wind data and air quality data is measured, the hour reflects the hour in which the measurement was taken, and not necessarily the exact time

As discussed earlier, November 2, 2015 was a scheduled sampling day for the FRM samplers, which do not provide hourly data. However, complementing the FRM measured data set are hourly measurements from continuous BAM 1020 monitors in Brawley, El Centro, Niland and Westmorland, none of which exceeded. Meteorological and data analysis indicates that airflow during the highest levels of winds and highest elevated concentrations came from transported windblown dust from the west or southwest, **Figure 2-24**. According to analysis, the airflow affecting the Westmorland monitor had a direct westerly direction, over natural open areas, at all measured airflow levels, during the hours leading up to 1600 PST. During the same hours, the other monitors had a pronounced southerly influence, over developed or agricultural lands, at the lower airflow levels, accounting for less saltation of particles and less deposition onto the monitors. By 2300, PST airflow was west coincident with elevated concentrations at all monitors. As winds begin to subside during the early morning hours of November 3, 2015, so do concentrations. Similarly, as gusts of winds intermittently increase on November 3, 2015 so do concentrations. November 3, 2015 did not exceed the NAAQS because winds were insufficiently strong in speed or inconsistent in gust to allow for deposition of any suspended particles.

While surface measurements may differ between the types of instruments that measure wind speeds, gust and direction the difference typically does not change overall conclusions. As discussed previously, winds elevated, as measured at the local airports, at or around noon and continued through the evening hours. This is consistent with the system moving inland allowing prefrontal winds to reach the mountains and desert slopes of the San Diego during the morning hours of November 2, 2015. Sites located southwest of Imperial County measured elevated winds earlier than sites located west or northwest. The Mountain Springs Grade site measured elevated winds as early as midnight, others such as Boulevard measured elevated winds by 0500 PST. In any event, by approximately noon all sites measured elevated winds, as did concentrations at the air monitors, Westmorland measuring the highest concentrations. Elevated winds continued through the evening hours.

The effect of the gusty westerly winds was evident when KNJK reported blowing dust for three hours (1756 PST to 1956 PST) and KIPL reported haze for three hours (1853 PST to 2006 PST) both coincident with the highest measured wind speeds 30 mph to 43 mph.

The aforementioned analysis of wind direction, wind speed and the duration of the winds help to explain why the Westmorland FRM sampler exceeded on November 2, 2015. While all the continuous air monitors measured elevated concentrations, short of an exceedance, the elevated concentrations were coincident with elevated wind speeds. **Figure 5-4** is a graphical representation of the meteorological conditions existing November 2, 2015 as transported windblown dust entered Imperial County on November 2, 2015.

FIGURE 5-4
TIMELINE ANALYSIS OF TRANSPORTED DUST ON NOVEMBER 2, 2015

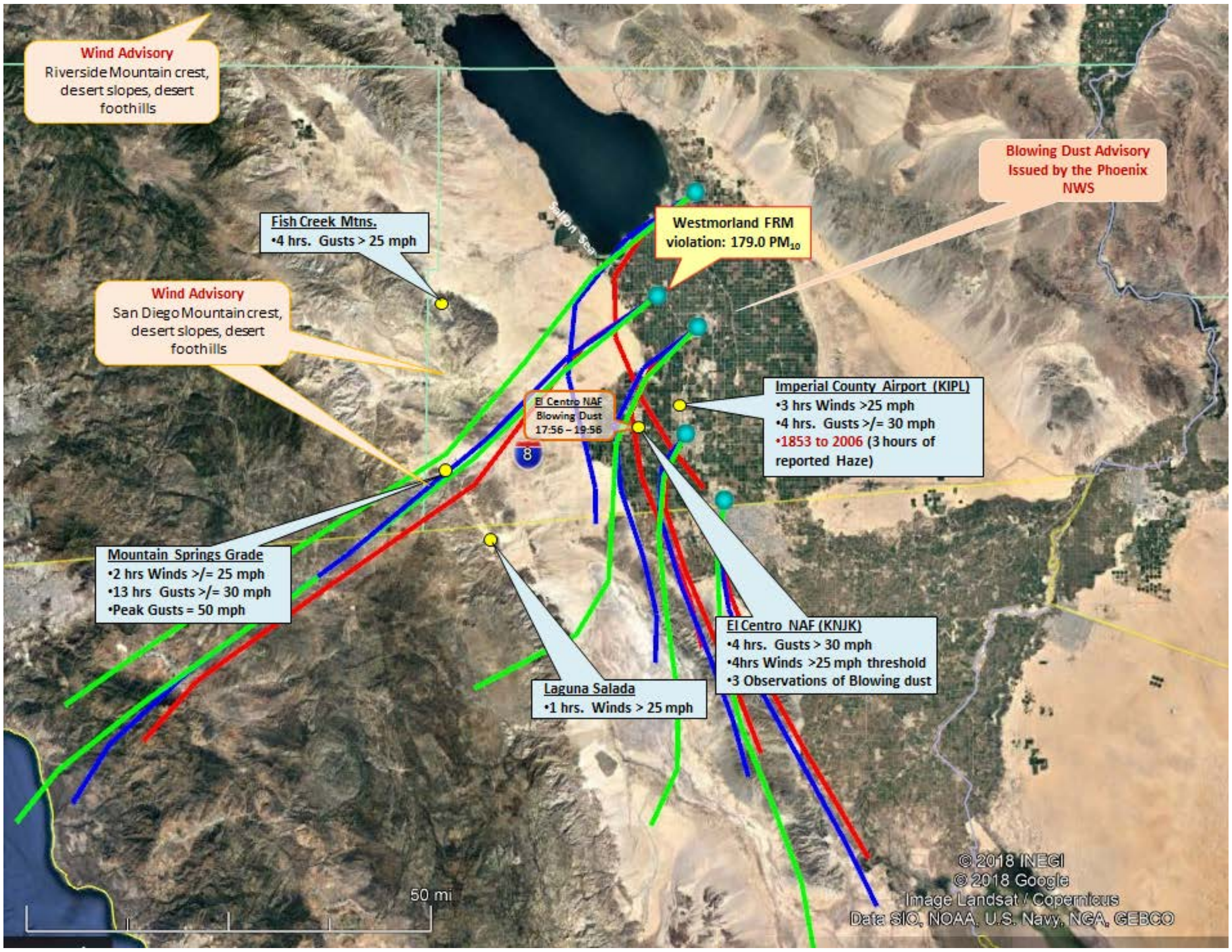


Fig 5-4: A six-hour HYSPLIT back-trajectory, which depicts the path of the air parcel ending at Westmorland at 1600 PST, coincident with measured peak concentration. Red trajectories indicate airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 meters AGL; and green indicates airflow at 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 5-8 depicts PM_{10} concentrations and wind speeds over a 72-hour period at Westmorland. Although winds at Westmorland did not exceed 25 mph, winds were sufficient to allow deposition of transported windblown dust onto the sampler.

FIGURE 5-5
PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

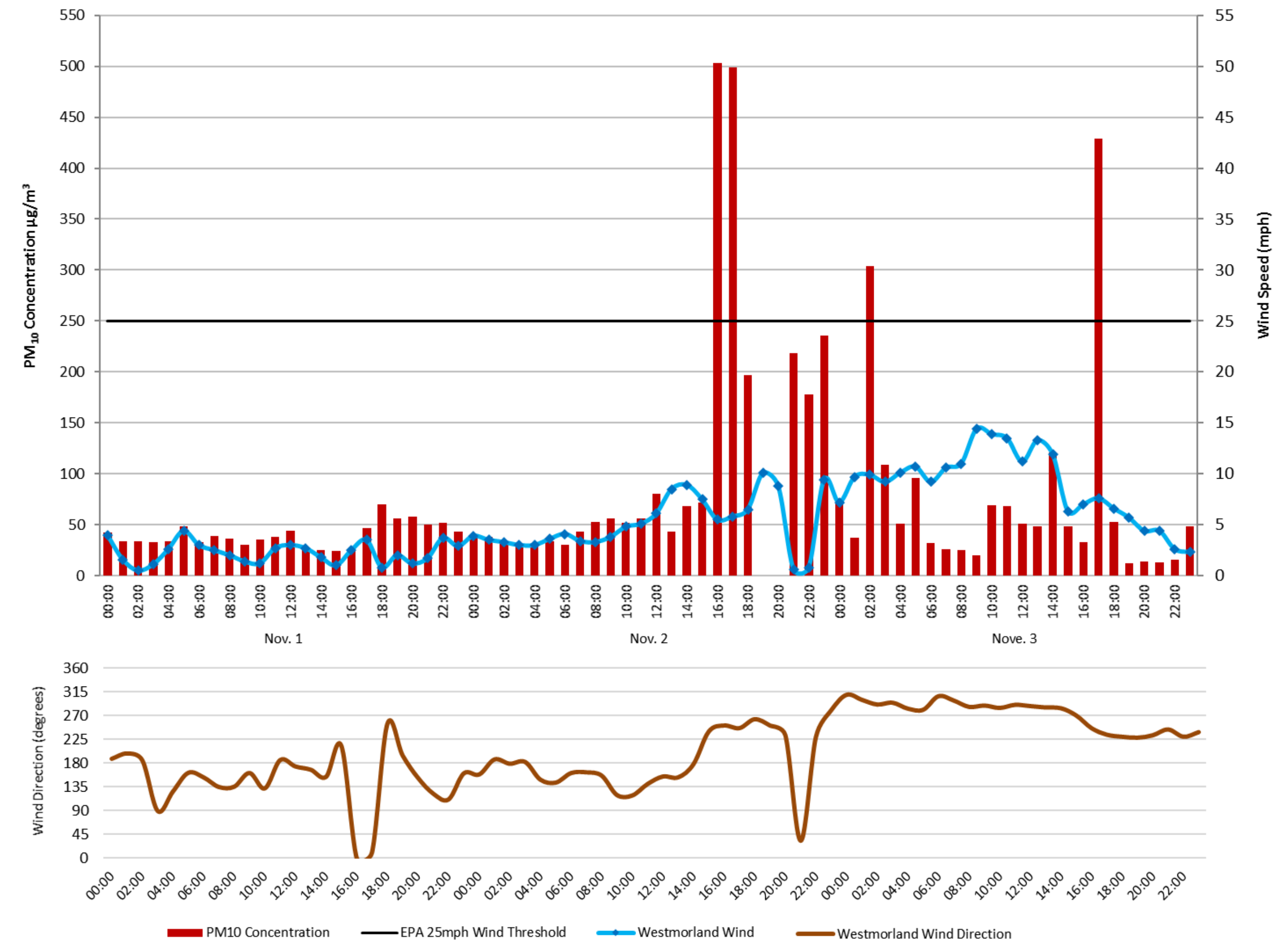


Fig. 5-5: The Westmorland PM_{10} BAM concentrations illustrate a positive correlation with increased winds and concentrations. Although winds measured in Westmorland did not reach 25 mph winds, as compared to the local airports, the winds were sufficient to allow for deposition of windblown dust onto the sampler. Although the meteorological sensor does not measure gust more than likely gust played a significant role in deposition of particles onto the monitor. In any event, the winds at the Westmorland station were lowest during the highest hourly concentrations but coincident with elevated measured winds at the El Centro Naval Air Facility (KNJK) (**Figure 5-6**).

Figure 5-6 is a three-day depiction, the day before, the day after and the event day November 2, 2015, of the PM_{10} concentrations for the Westmorland BAM monitor. Fluctuations in hourly concentrations at Westmorland over 72 hours show a positive correlation with wind speeds, and gusts, at upstream wind locations.

FIGURE 5-6
72 HOUR PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

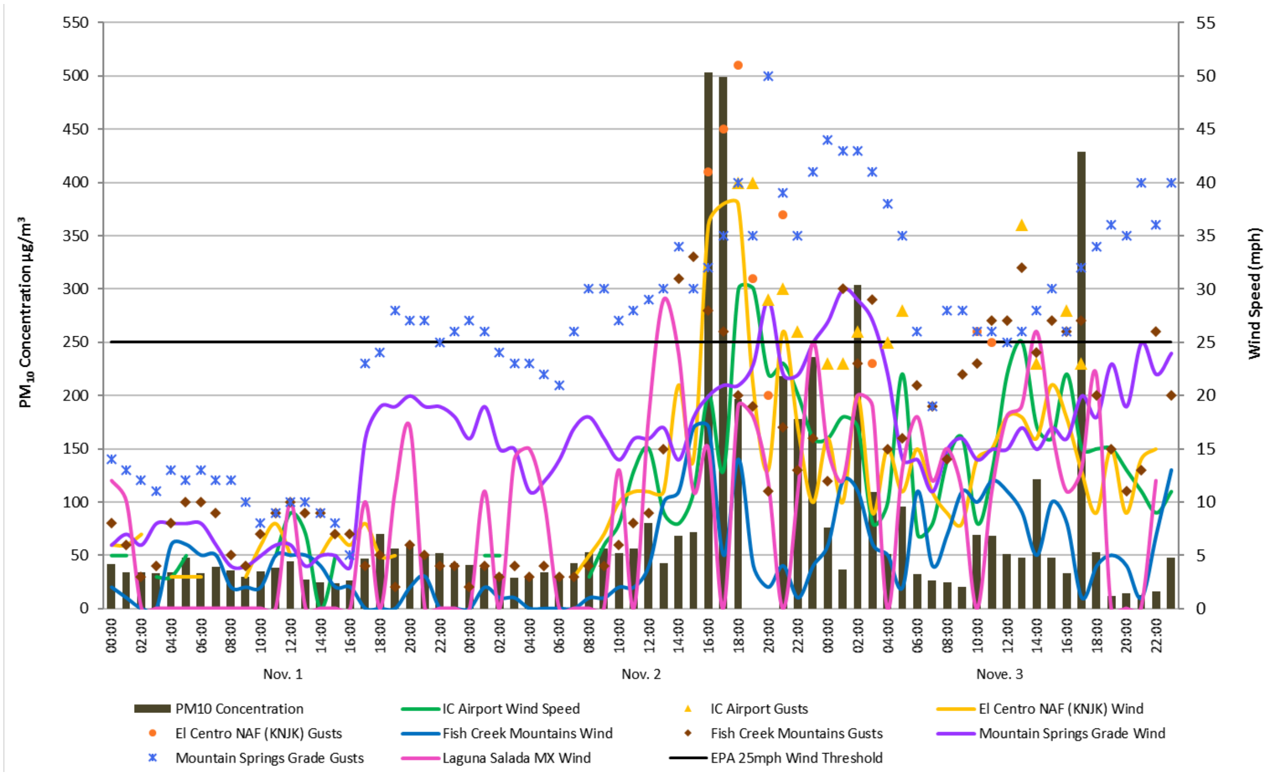


Fig 5-6: This graph illustrates the concentration levels and wind speeds for the day before, day after and November 2, 2015 for the Westmorland BAM monitor. Due to the different times during the hour that wind and air quality data is measured, the hour given represents the hour in which the measurement was taken, and not necessarily the exact time.

Figure 5-7 compares the concentrations at El Centro, Brawley, Westmorland, and Niland over a 72-hour period between November 1, 2015 and November 3, 2015. Visibility at Imperial County Airport (KIPL) fell just prior to measured peak concentrations at Brawley, Niland, and Westmorland. The El Centro NAF (KNJK), similarly, saw reduced visibility during the same time.[14]

[14] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm.

FIGURE 5-7
72 HOUR PM_{10} CONCENTRATIONS AND VISIBILITY

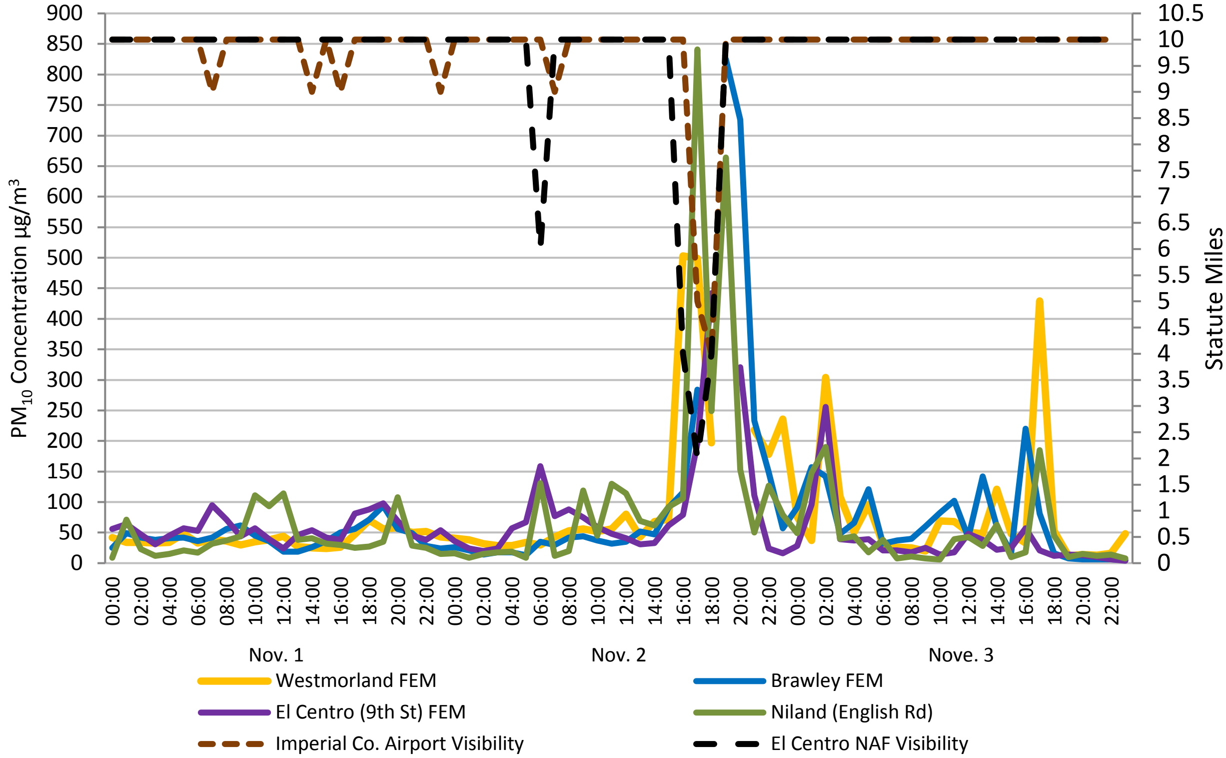


Fig 5-7: Hourly concentrations at Westmorland peaked at around the time visibility at El Centro NAF was at its lowest. Due to the different times during the hour that visibility observations are measured and air quality data is measured, the hour given represents the hour in which the measurement was taken, and not necessarily the exact time.

The NWS issued a Wind Advisory and a Blowing Dust Advisory for Imperial County for the evening and nighttime hours (**Appendix A**). The ICAPCD posted on its website a notice from the NWS advising of the potential for elevated particulate matter due to high winds. The high winds lofted fugitive dust on the western edge of the Sonoran Desert beyond the San Diego-Imperial County border and transported it downstream. **Figure 5-8** is the resultant Air Quality Index[15] (AQI) for the Brawley area on November 2, 2015 (Westmorland AQI is unavailable for this time period). The Air Quality Index for November 2, 2015 remained in the Good or “Green” category from 1 a.m. to 7 p.m., before rising to the Moderate or “Yellow” category from 8 p.m. to 10 p.m. The AQI entered the Unhealthy for Sensitive Groups or “Orange” from 11 p.m. to 12 p.m., confirming that the fugitive dust transported by high winds had impacted the quality of air in Imperial

[15] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi.

County.

FIGURE 5-8
AIR QUALITY INDEX FOR BRAWLEY NOVEMBER 2, 2015

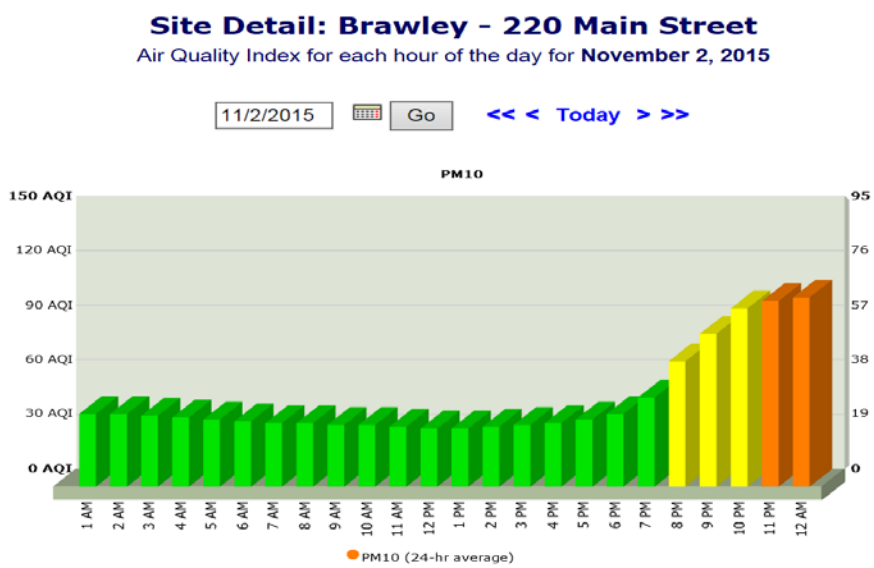


Fig 5-8: Air quality in the Brawley area was affected when high winds lofted and transported dust into the Imperial Valley. A similar AQI for Westmorland during this time is unavailable.

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the steep pressure gradient accompanying the low-pressure system that passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Westmorland monitor on November 2, 2015. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} transported by strong westerly winds into the lower atmosphere caused a change in the air quality conditions within Imperial County. The entrained windblown dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on November 2, 2015 coincided with high wind speeds and that gusty west winds experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-9
NOVEMBER 2, 2015 WIND EVENT TAKEAWAY POINTS

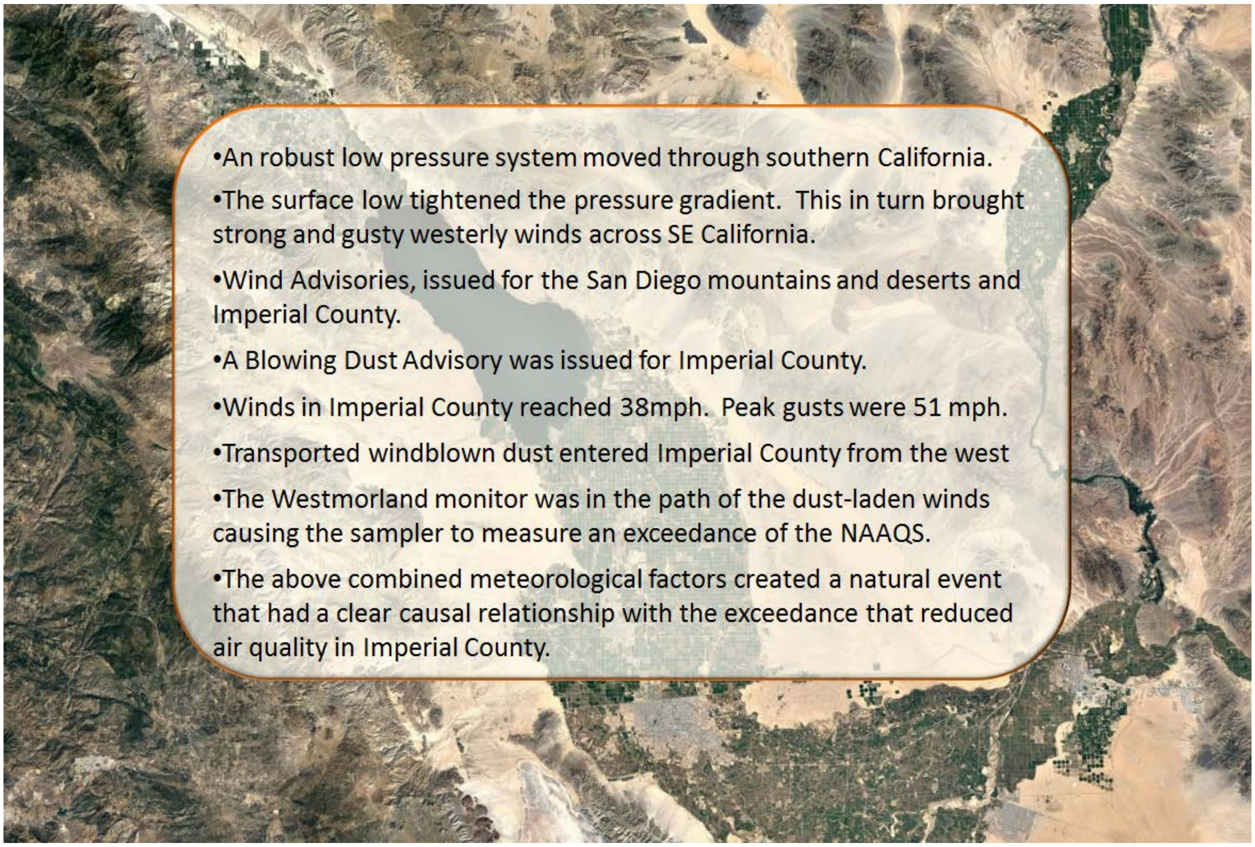


Fig 5-9: Illustrates the factors that qualify the November 2, 2015 natural event which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on November 2, 2015, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-36
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	49-60
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	37-41
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	42-48
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	6-36 & 49-60

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the November 2, 2015 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be "not reasonably controllable or preventable" (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, strong gusty winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Westmorland monitor caused by naturally occurring strong gusty westerly winds transported windblown dust into Imperial County and other parts of southern California from areas located within the mountains and deserts of San Diego County. These facts provide strong evidence that the PM_{10} exceedance at Westmorland on November 2, 2015, were not reasonably controllable or preventable

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event with its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at Westmorland on November 2, 2015, was caused by the transport of windblown dust into Imperial County by strong westerly winds associated with the passage of low-pressure system that moved through the region. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Westmorland during different days and the comparative analysis of different monitors in Imperial and Riverside Counties demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} on November 2, 2015 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on November 2, 2015.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley, Westmorland, and Niland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1)(i))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around November 2, 2015. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County. In addition, the **Appendix A supplemental** contains all the NWS notices issued by either the San Diego or Phoenix office by date and time order

Appendix B: Meteorological Data

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.